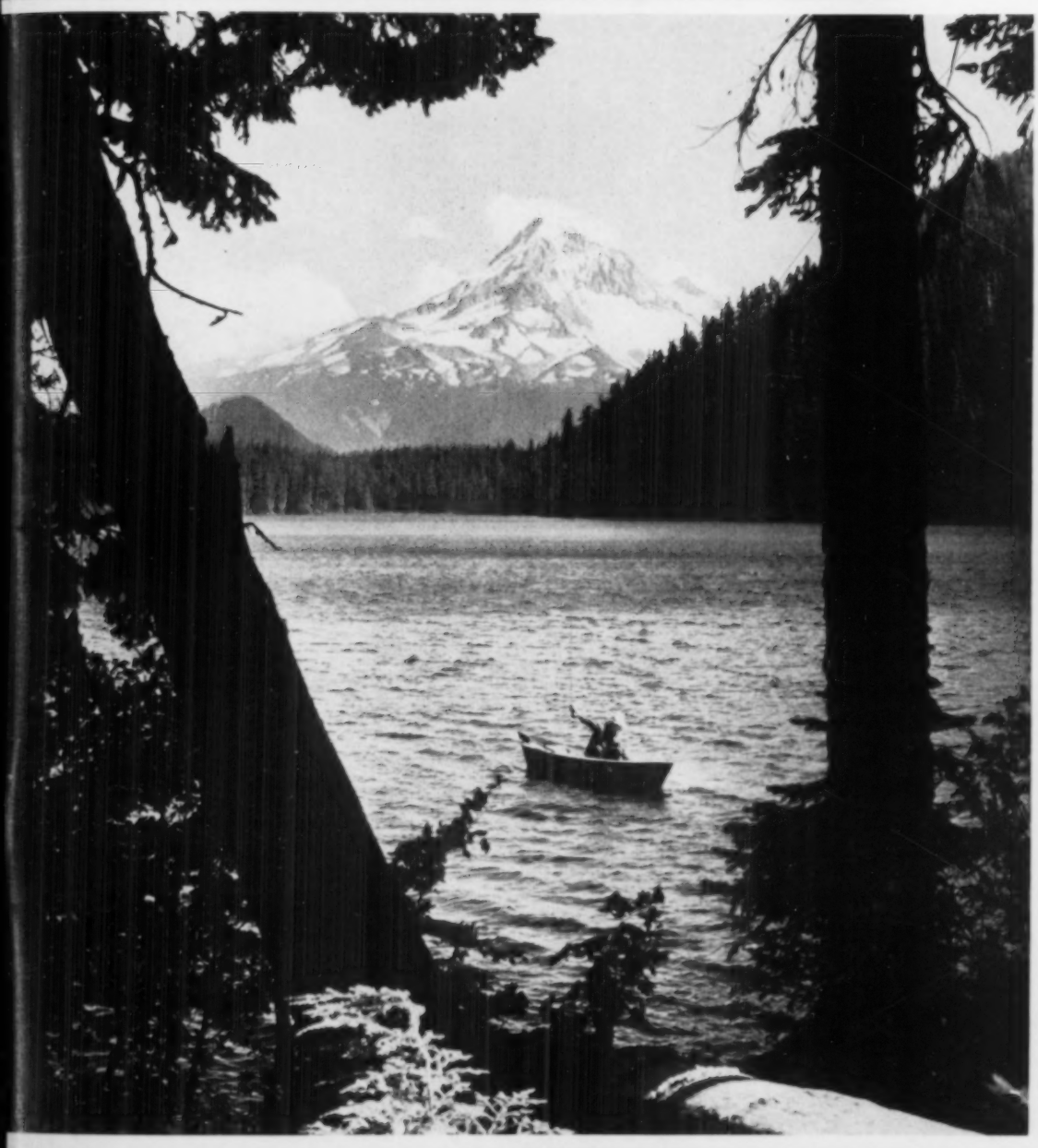
Compresse

PERMANENT FILE
IR
LITERATURE
Return this copy to
Advertising Division
Ingersoll-Rand
Phillipsburg, New Jersey
File _____
X-1850 IR 2M 10-54

JUNE 1953



TROUT FISHING
IN LOST LAKE
A Soothing Scene in Oregon
with Mount Hood Rising
in the Background

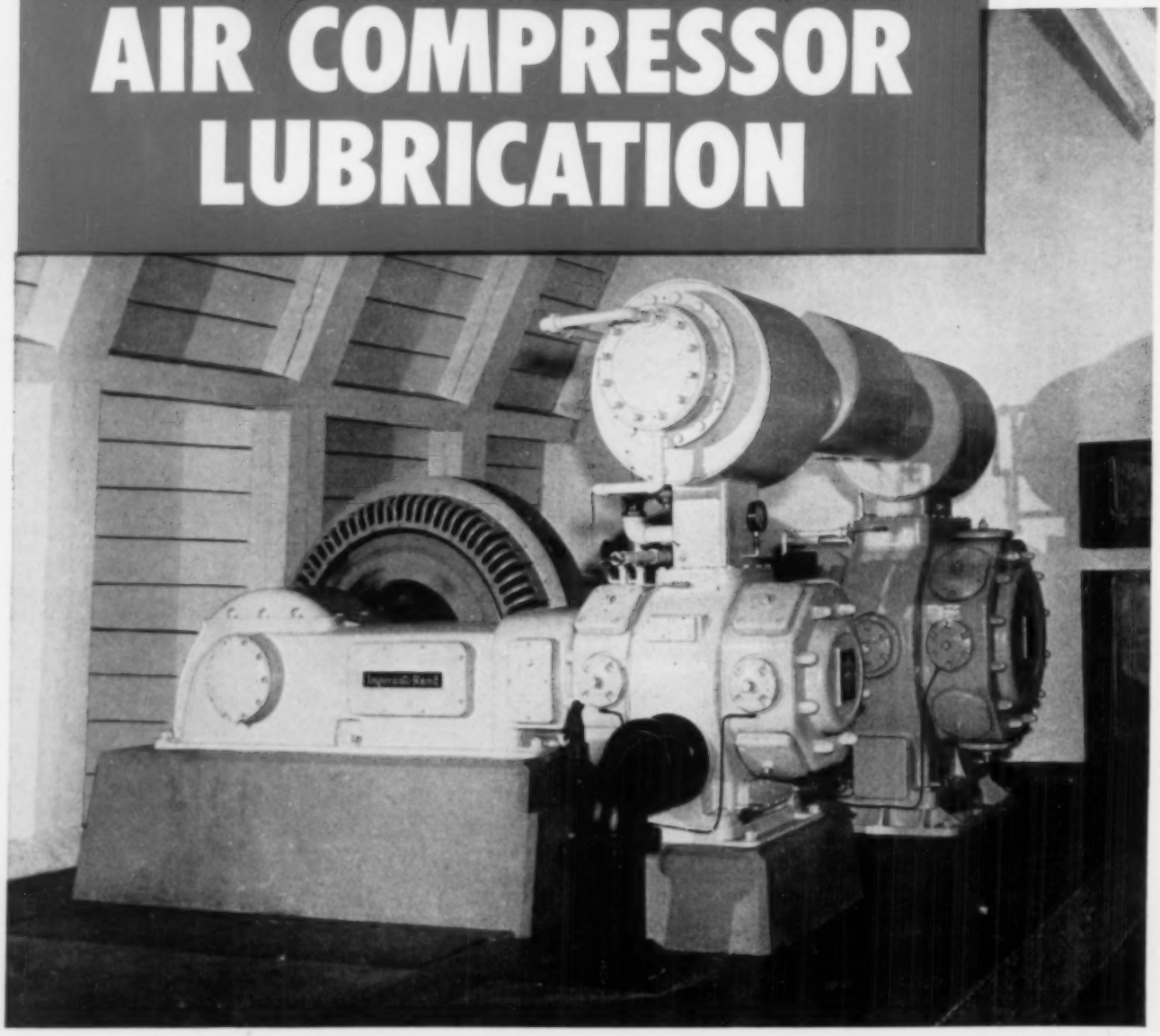
(SEE INDEX PAGE)

PHOTO, DAVID W. CORSON FROM A. DEVANEY, NEW YORK

VOLUME 58 • NUMBER 6 NEW YORK • LONDON

2 facts to remember about

AIR COMPRESSOR LUBRICATION



Fact No. 1: You have to lubricate according to the particular operating conditions. An oil suitable for normal service, for instance, will not be right where rusting conditions are bad. There is no *one* oil that can give top results under *all* conditions.

Fact No. 2: You can get an oil from Texaco that will assure clean, low-cost compressor performance *under your particular operating conditions.* There is a complete line of Texaco air compressor oils—covering every operating condition, every type and size of compressor.

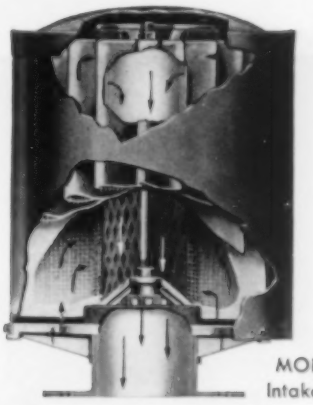
A Texaco Lubrication Engineer will gladly help you select the right one. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Air Compressor Oils

FOR ALL OPERATING CONDITIONS

BEST ENGINE PROTECTION MONEY CAN BUY!



MODEL D
Intake Filter

STAYNEW INTAKE FILTERS

STAYNEW INTAKE FILTERS keep shutdowns and repairs at an absolute minimum. Industrial engineers everywhere know that Staynew's *positive protection* lengthens engine life. They may cost more than ordinary intake filters, but with Staynew, you're assured of engines operating at top performance years longer. Staynew Intake Filters' extreme efficiency protects vital engine parts without carefully held maintenance schedules. And, efficiency actually increases with use. They're efficient over a wide range of loads, not affected by temperature changes, there's no oil carry over and no oil blow-out on free air unloading compressors. To keep equipment young *longer*, always specify Staynew.

Write today for Intake Filter Bulletin S.I.F.

Representatives in Principal Cities

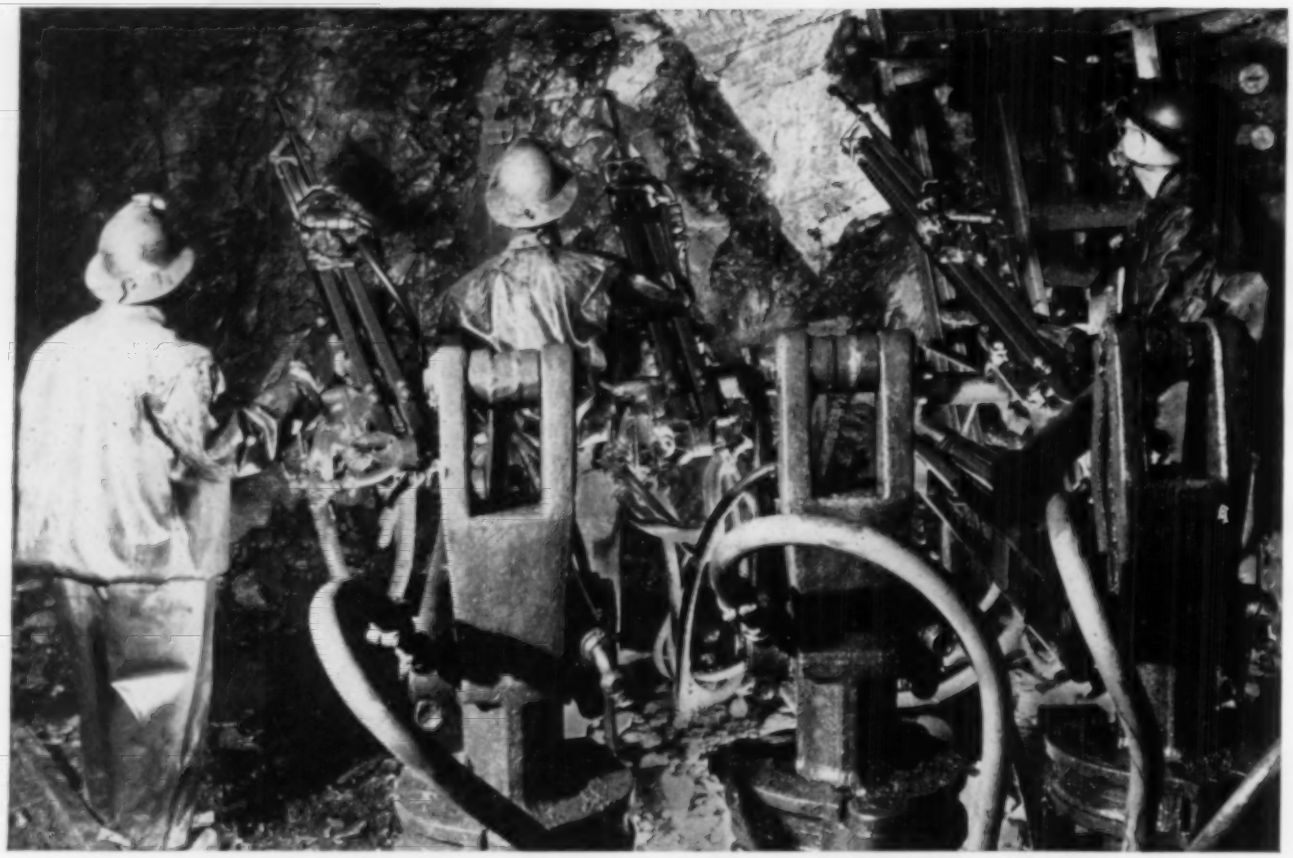
DOLLINGER PROTECTS MOTOR LIFE STAYNEW FILTERS

DOLLINGER

CORPORATION

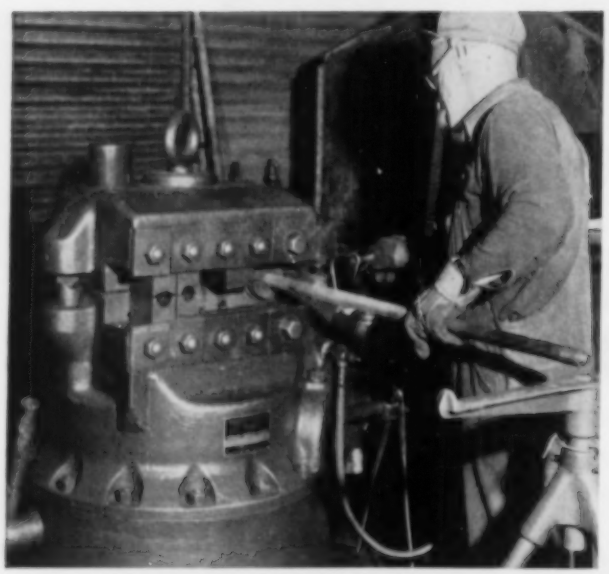
7 Centre Park Rochester 3, N. Y.

ALL TYPES OF FILTERS
FOR EVERY INDUSTRIAL NEED



This mobile jumbo mounts three drifters for drilling a fast round in the footwall slate as headings are advanced on the 2,400-ft level. Carbide-tipped bits and Bethlehem hollow drill steel are relied on to keep the job on the move.

Driving an 8,800-ft drift to open up large tonnages of Marquette ore



The sharpener operator shanks a 1-in. quarter-octagon rod in the well-equipped drill steel shop operated by the Mather Mine.

Photos courtesy of H. H. Korpinen, Superintendent, Mather Mine.

A substantial increase in the production of iron ore at the Mather Mine depends on a newly-driven drift which connects the famous A and B shafts located at Ishpeming and Negaunee, Michigan. Being driven from two headings on the seventh level, 2,400 ft below the surface, the main level drift makes it possible to turn cross-cuts under sizable ore bodies.

Drilling, blasting, and mucking were carried on at a fast pace from the time the project was begun in early 1951. From start to finish, they have relied on Bethlehem hollow drill steel to help keep the drilling on schedule, both in this vital haulage tunnel and elsewhere at this property.

Output of iron ore at this mine totalled 1,635,256 tons in 1951. Production in 1952 reached 1,701,343 tons, an all-time record for the Marquette Range. The management expects the mine ultimately to reach an annual capacity of 3 million tons.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

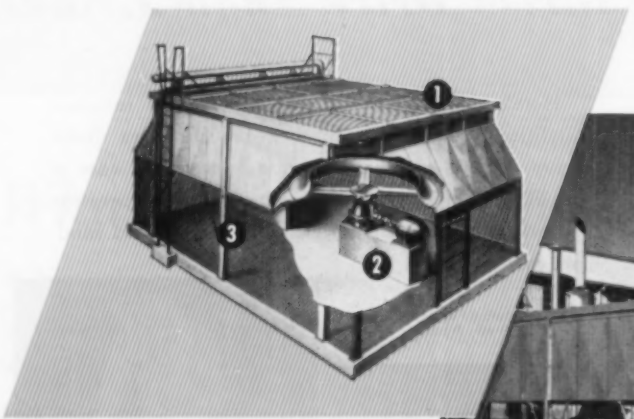
BETHLEHEM STEEL

BETHLEHEM HOLLOW DRILL STEEL

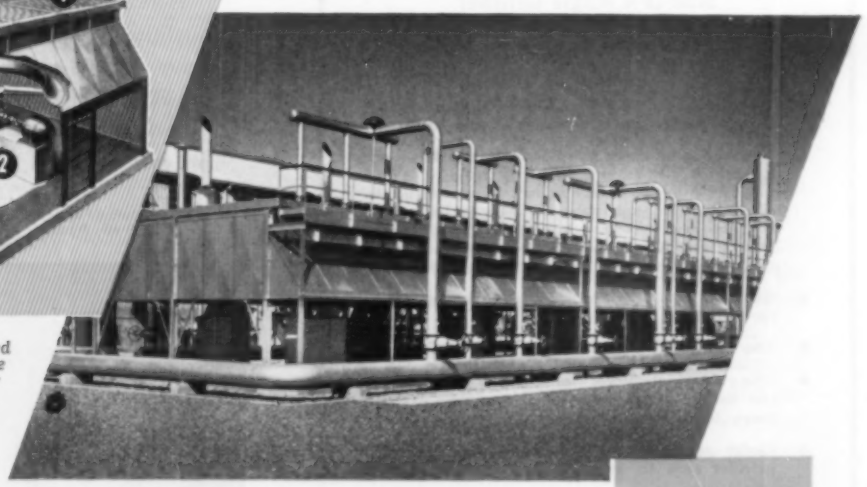
For low cost waste heat removal investigate **Fluor Fin-Fan!**

For economical dissipation of heat loads from liquids and gases, the Fluor Fin-Fan air-cooled heat exchanger is your answer. It is highly versatile, adaptable to a wide range of duties and capacities, serves in any climate independent of wind and water conditions, and is designed for any cooling requirement where final fluid temperature is higher than dry bulb air temperature.

Fluor Fin-Fans are used in a multitude of applications on gas transmission lines, in petroleum refineries, light hydrocarbon processing plants, chemical processing plants, power and related industrial plants of many descriptions. They are designed for cooling services involving pressures up to 5000 psi and at temperatures to 1500° F. The Fluor Fin-Fan is the ultimate in simplicity, structurally and mechanically. Each unit is individually sized for each heat transfer problem and can be single pass or multi-pass, single cell or multi-cell, connected in series for long temperature ranges, in parallel for large capacities, or in combinations to best suit the cooling need.



A Fluor Fin-Fan consists of three simplified components: (1) The new improved Transaire heat transfer surface that provides greater cooling at no increase in horsepower. (2) Independently mounted fan, gear and driver located at ground level for easy maintenance. (3) Steel structure completely prefabricated for easy field erection.



Gas cooling at a compressor station on a Texas pipeline.

Write today for a copy of our new illustrated booklet describing the Fluor Fin-Fan in detail—Bulletin FF-FD-0.001.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD.
LOS ANGELES 22, CALIFORNIA

FOREIGN: FACTS-FLUOR-PARIS
FLUOR OF CANADA-TORONTO
FLUOR INTERNATIONAL-BEIRUT
HEAD WRIGHTSON-LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

NEW YORK
CHICAGO
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

this is NEWS!!

AIR POWERED ANGLE GRINDER *without Gears*

Another Ingersoll-Rand First . . . a Direct Drive Angle Grinder

Size 2FA Angle Grinder

Features

- **This advanced grinder design eliminates the need of bevel gears, or gears of any kind.**
- **Two types of dead handles are available - one is straight, the other is 30° off of straight. These handles may be attached to either side of the grinder. The angle dead handle can be rotated to any one of four positions. This means that the tool can easily be adapted for corner grinding or for right or left handed operators.**
- **Built-in lubricator provides ample lubrication for long life.**
- **The motor is muffled to reduce noise.**
- **The exhaust deflector, located on the bottom of the tool, is adjustable to deflect the exhaust away from the operator.**
- **Quick-acting throttle makes this powerful grinder easy to use.**
- **Heavy-duty ball bearing construction throughout.**

Specifications

Speed, at 90 lb. air pressure	*6000 rpm
Length overall	15¼"
Height of angle head, less wheel	7⅛"
Weight, less guard	10 lbs.
Arbor diameter	⅝" - 11 thd.
Flared cup grinding wheel diameter	5"
Sanding pad diameter	7"
Size hose	½"
Hose connection pipe tap	½"

*Size 2FA-80 Angle Grinder, operating at 8000 rpm, is also available for special applications.

Here's an Angle Grinder that has the inherent qualities of any angle grinder, but features direct drive with no gearing! Its extra power and ease of handling provide fast, efficient and safe operation on practically all surface grinding, cut-off and sanding jobs.

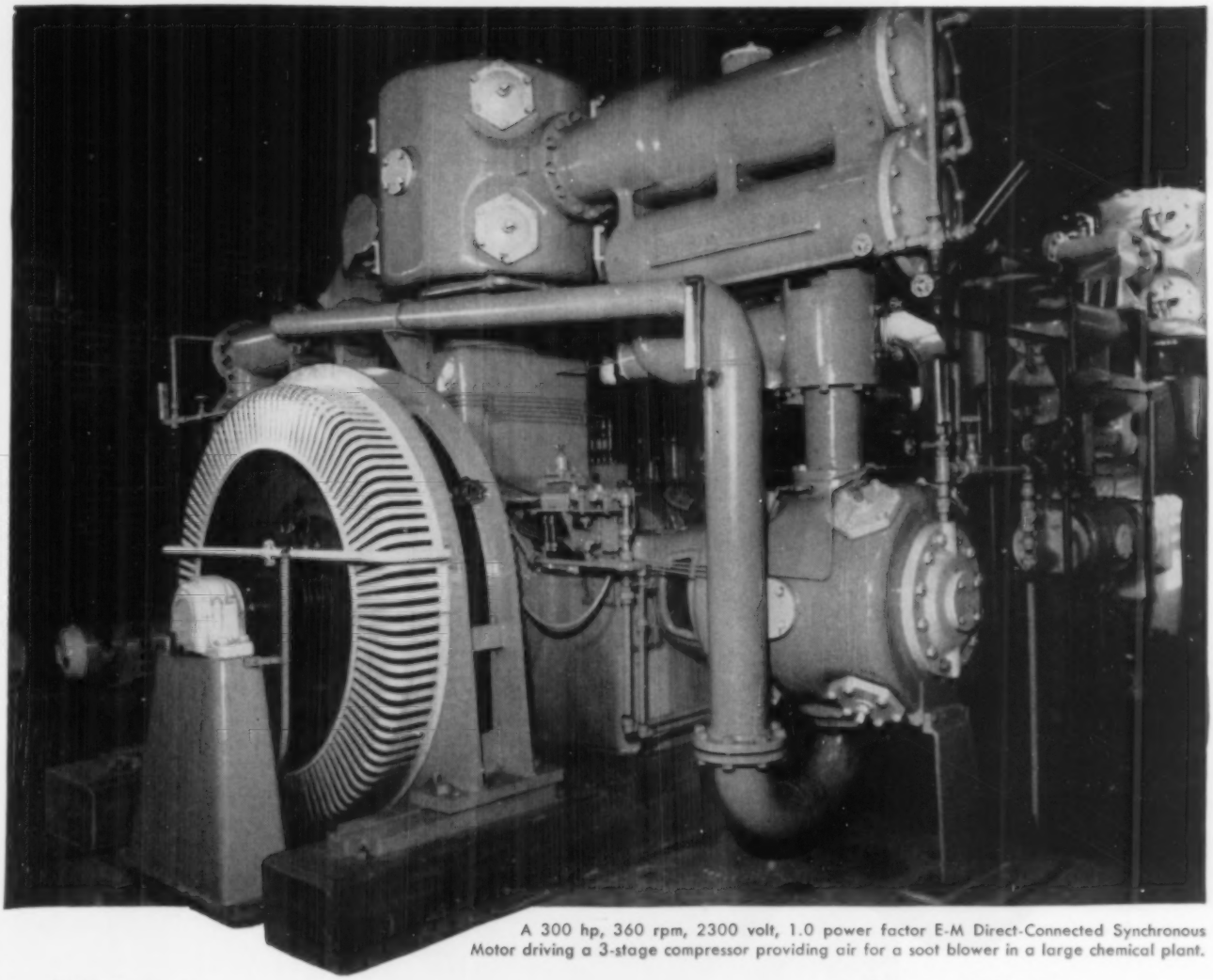
Grinding a casting with the 2FA-60 Angle Grinder. ▶

▲ 2FA-60 Angle Grinder with cut-off wheel nicking risers.

Sanding car hood with 2FA-60 Angle Grinder. ▶

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 895-A



A 300 hp, 360 rpm, 2300 volt, 1.0 power factor E-M Direct-Connected Synchronous Motor driving a 3-stage compressor providing air for a soot blower in a large chemical plant.

What every new compressor should have

● Nicest thing you can do for a new large compressor is to couple an engine-type synchronous motor to it. There's no better way to assure a most economical, reliable and trouble-free drive. Look at the advantages:

1. HIGH EFFICIENCY conversion of electric power to mechanical power by synchronous motors . . . resulting in minimum electric power cost operation of the compressor.

2. POWER FACTOR CORRECTION by unity or 0.8 leading power factor synchronous motors . . . supplying leading reactive kva to improve plant power factor and further reduce power costs, save money on your power bills.

3. DIRECT-CONNECTED synchronous motors save valuable floor space and require minimum maintenance.

4. SIMPLE STARTING at full voltage is suitable for most direct-connected synchronous motor compressor applications. Or you can use E-M-invented part-winding starting where starting limitations are severe. E-M starting arrangements are low in first cost and maintenance cost.

And there's nothing nicer for your compressor than an *E-M* Direct-Connected Synchronous Motor. E-M, pioneers in the development of synchronous motors and control, have over 40 years' experience in the design of synchronous motors incorporating desirable characteristics and features such as those above.

Let the E-M specialist engineer team design a smooth-running, modern drive unit to meet the requirements of your new compressor application. For complete information on E-M Synchronous Motors and their application in your plant, consult your nearest E-M sales engineer. And write for the issue of the E-M Synchronizer titled "The ABC of Synchronous Motors".

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

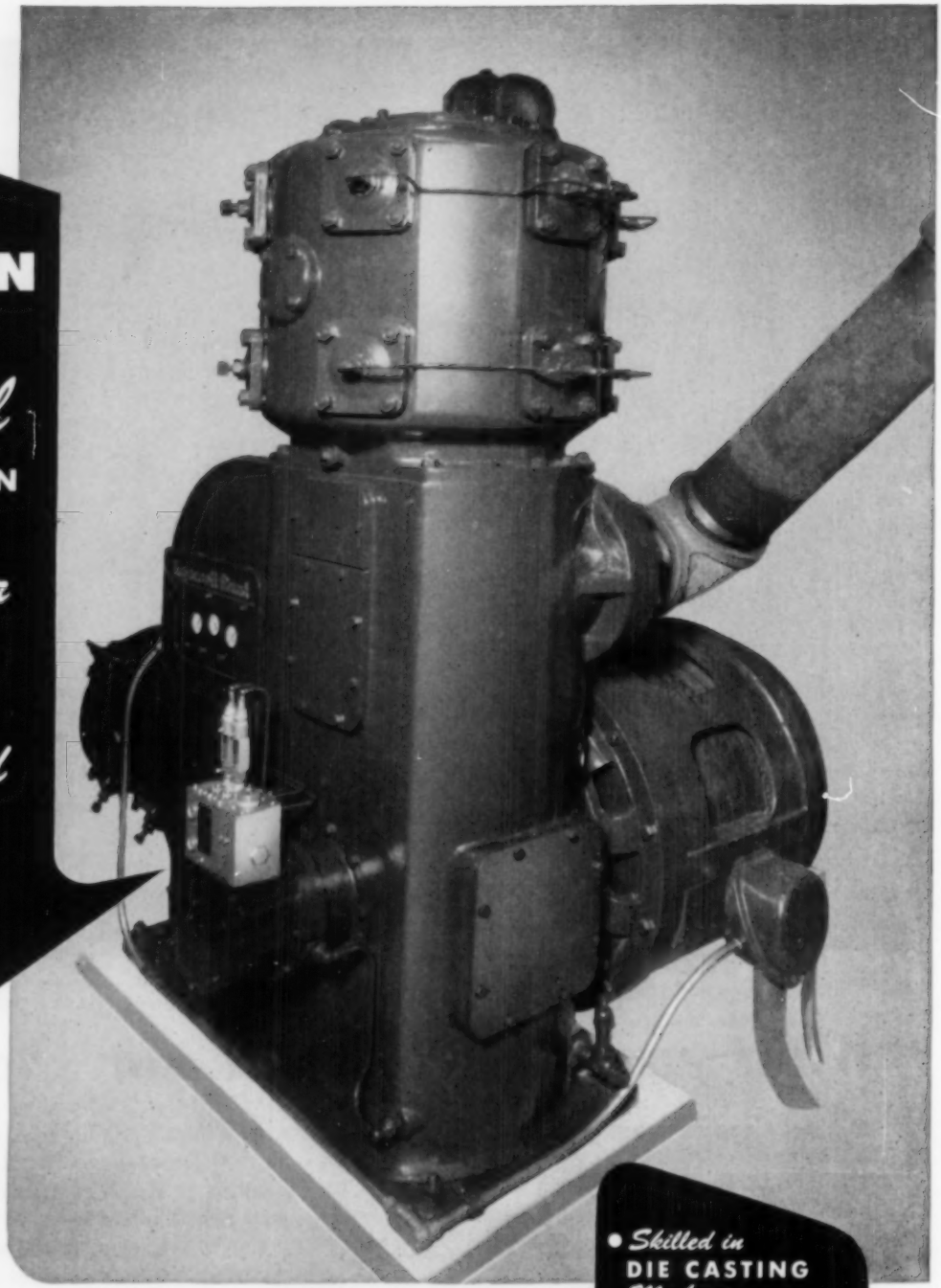
1200-TPA-2136

E-M

SPECIALISTS IN
BIG MOTOR ENGINEERING

MADISON -KIPP *fresh oil* LUBRICATION

fed under pressure by the measured drop!



Illustrated, the Madison-Kipp Model SVH Lubricator on an Ingersoll-Rand XLE Compressor.

- *Skilled in* **DIE CASTING** *Mechanics*
- *Originators of Really High Speed* **AIR TOOLS**
- *Experienced in* **LUBRICATION** *Engineering*

....STANDARD EQUIPMENT ON COMPRESSORS, WORK ENGINES AND MACHINE TOOLS....

Oil under pressure fed drop by drop from a Madison-Kipp Lubricator will definitely increase the production potential for years to come when applied as original equipment on new machine tools, work engines and compressors. There are six popular models for every application. Write for special engineering data for your particular requirement.

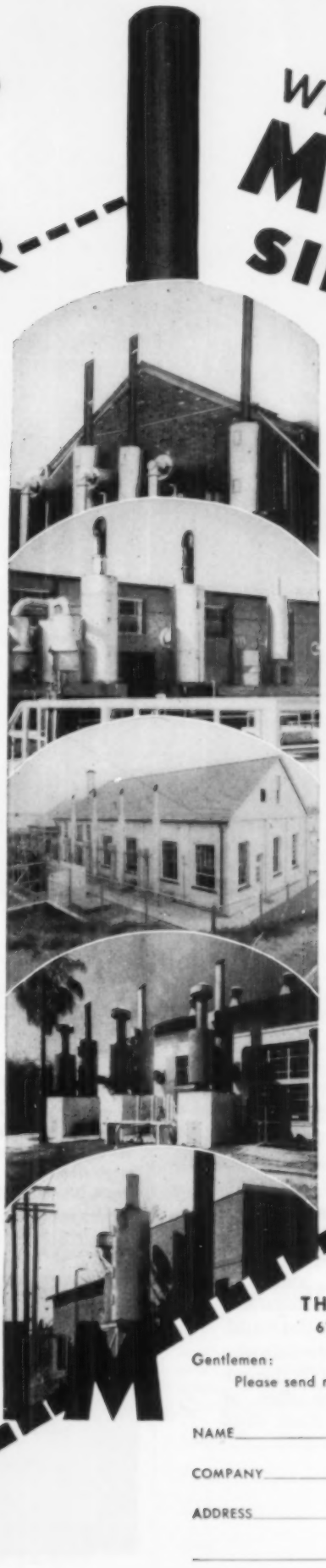
MADISON-KIPP CORPORATION

202 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

YOU'RE ALWAYS A GOOD NEIGHBOR---- WITH MAXIM SILENCERS



When horsepower has to work 24 hours a day in close proximity to residential and business areas, the best exhaust silencing you can get is just downright necessary.

That is one very good reason why public relations-conscious municipal plants from coast to coast choose Maxim Silencers.

Maxim Silencers are backed by longer manufacturing experience, more field use, and the broadest engineering and research background in acoustics available.

Because silencing needs vary so greatly, good engineering advice to start with is almost as important as the product. Maxim engineers know municipal plant problems, and can be of real assistance in planning efficient installations. They are at your service.

Consult **MAXIM**

THE MAXIM SILENCER COMPANY
61 Homestead Ave., Hartford 1, Connecticut

Gentlemen:
Please send me your bulletins on Exhaust and Intake Silencers.

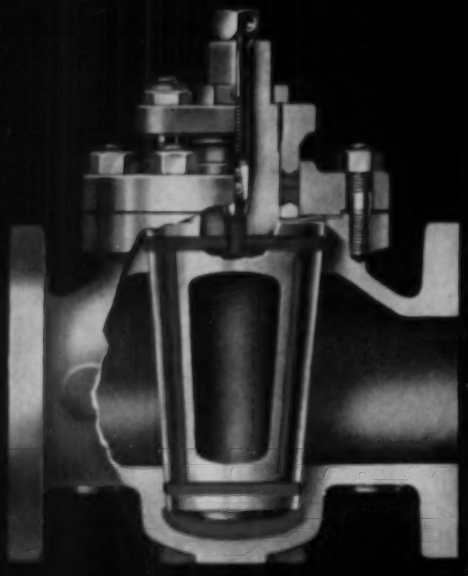
NAME_____

COMPANY_____

ADDRESS_____

_____

10MX53



LUBRICATED PLUG

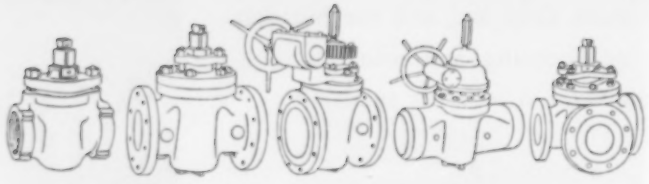
COMPLETE LINES OF LUBRICATED PLUG VALVES

Because of the wide range of services to which Lubricated Plug Valves can be adapted, they may be classed as "all-purpose" valves. Walworth manufactures complete lines of Lubricated Plug Valves in a variety of types and materials for working pressures up to 5,000 psi and for vacuum services. Sizes range from ½ to 30 inches. Write for descriptive literature.

Walworth also manufactures complete lines of gate, globe, angle, and check valves made of steel, bronze, iron, and special alloys.

Walworth valves, pipe fittings, and pipe wrenches total approximately 50,000 items and are sold through distributors all over the world.

Walworth engineers will be glad to help you with your problems. Call your local Walworth distributor, nearest Walworth sales office, or write to our General Offices, 60 East 42nd Street, New York 17, New York.



Illustrated in section is a Walworth No. 1700F Regular Gland Type, Wrench Operated, Steeliron, Lubricated Plug Valve. This particular line of valves has a working pressure rating of 200 psi at 150F or 125 psi at 450F. Sizes range from ½ to 8 inches. Other Walworth Lubricated Plug Valves include Single Gland and Ball Bearing types. They are available for a variety of working pressures.

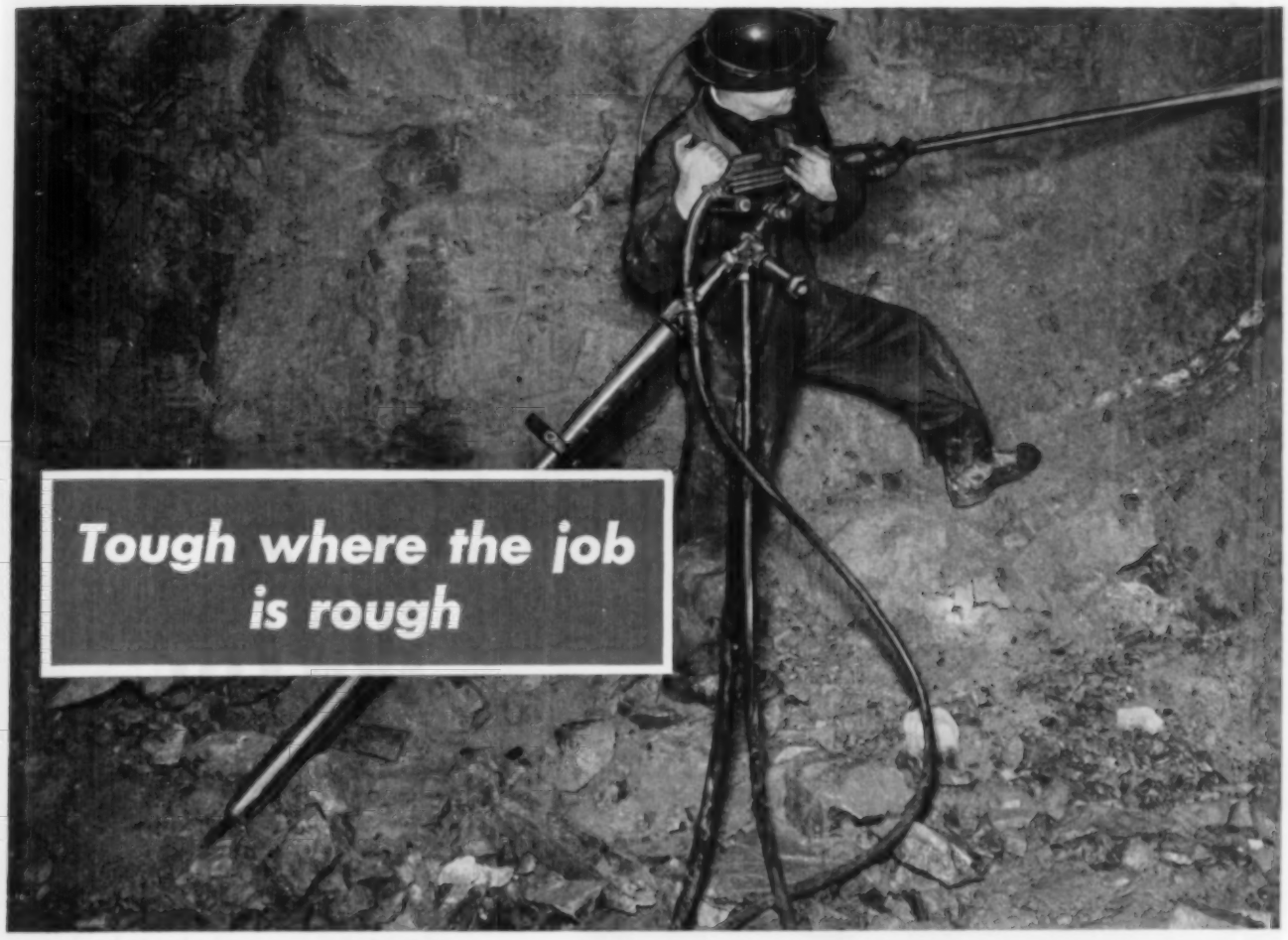
For best results use Walworth Lubricants and Walworth High Pressure Lubricant Guns.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.



Air hose with tube and cover of NEOPRENE assures long-lasting service in mining operations

Cutting through stubborn rock in mines is a rugged test for any equipment. There's especially rough handling in store for the hose that feeds a drill with compressed air. It's dragged along the mine floor over jagged rocks . . . twisted and pulled into hard-to-reach places. And while the hose cover gets this scuffing and scraping, the tube must withstand continual attack from hot, oil-laden air. But here's the hose to take this punishment and come back for more. It's made inside and out with neoprene.

The cover of neoprene is tough, durable and flame-resistant . . . resists abrasion, cutting and chipping throughout its long life. And in surface mining, because neoprene withstands the deteriorating effects of sunlight, heat and weathering, the fabric reinforcement receives maximum protection.

The neoprene tube won't go to pieces when exposed to hot lubricating oil in the air stream. No crumbled particles are carried along to clog vital tool parts. And neoprene's toughness and flexibility assure long, trouble-free service under the most adverse conditions.

Du Pont supplies neoprene to air-hose manufacturers who use it in their top-quality lines. Ask your supplier about hose with tube and cover of neoprene. He'll be glad to show you how it's built for rugged service.

FREE! THE NEOPRENE NOTEBOOK

Each issue brings you new, unusual applications of neoprene . . . new products . . . interesting stories. Send in this coupon to E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division CA-6, Wilmington 98, Del.

Name_____ Position_____

Firm_____

Address_____

City_____ State_____

NEOPRENE

The Rubber Made by Du Pont Since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

You?...

a Doubting Thomas?

IF YOU'RE a man who has to be shown, we're right in your corner. Just give Roebling "Blue Center" Steel Wire Rope one try . . . see for yourself how it saves time and costs you less on the job.

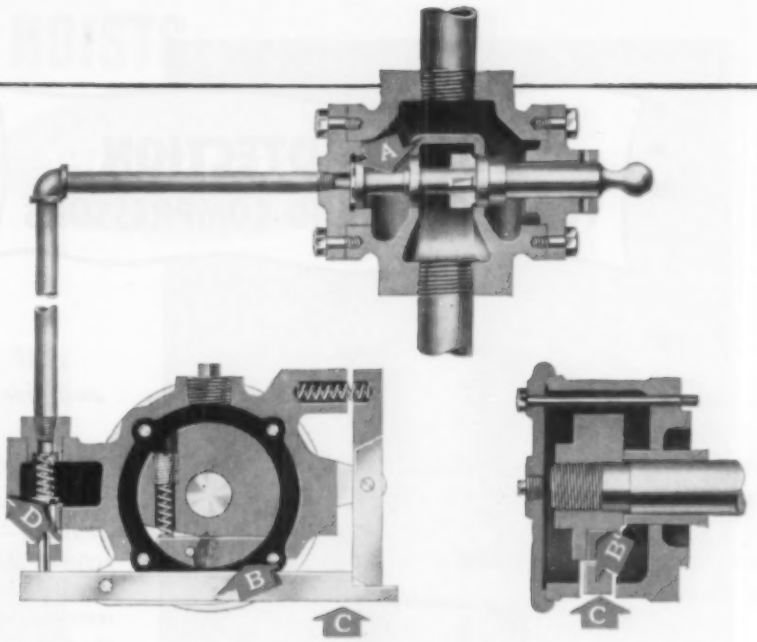
Two out of three wire rope users in excavating and construction prefer Roebling rope. Call the nearest Roebling office for a Field Man to suggest the best ropes for your purposes.

ROEBLING

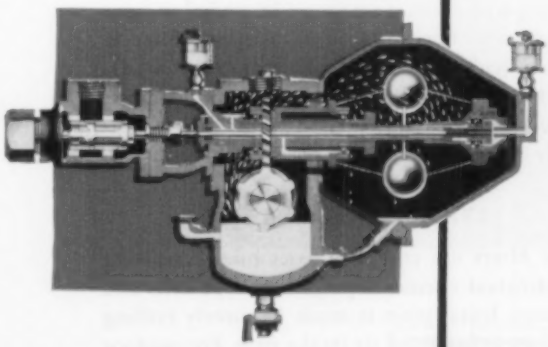
A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE, ST. • EXPORT SALES OFFICE TRENTON 2, N. J.

Only Coppus Turbines offer you *a pilot operated* excess speed safety trip



The constant speed governor on Coppus Turbines, plus this Excess Speed Safety Trip, gives you extra protection for your turbine investments. Here's how it works. When steam is turned on, pressure opens valve A fully. When excess speed is reached, centrifugal force throws weight B against lever C lifting pilot valve D. This releases pressure in back of valve A, closing this valve instantaneously, to shut off the steam. Safety trip can be tested easily while turbine is running by manually tripping and resetting lever C.



Sectional view showing lubricating system of fully enclosed Coppus Constant Speed Governor. Governor head acts directly on stem of steam admission valve. No external levers required. Ball bearing construction eliminates end play and gives frictionless operation.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

CUT YOUR COSTS PER HORSEPOWER

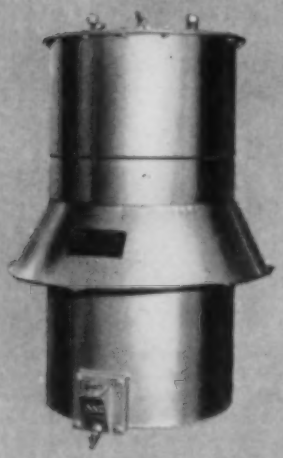
When you choose from the Coppus Steam Turbine line, you get the right size for your requirements . . . and make substantial savings on *any* size from the 150 hp turbine down to the smallest. Low in first cost, Coppus Turbines save you more money in the long run. Operating and maintenance costs are kept low by such other features as: large number of steam nozzles, controlled individually by manually operated valves; hard chromium plating on shaft at the stuffing box; replaceable cartridge type bearing housings; optional carbon ring packing assembly for back pressures up to 75 pounds.

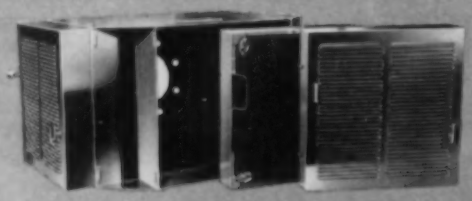
WRITE FOR BULLETIN 135

COPPUS ENGINEERING CORPORATION, 206 Park Ave., Worcester 2, Mass. Sales offices in THOMAS' REGISTER.

COPPUS "BLUE RIBBON" TURBINES

DUST PROTECTION
FOR ENGINES AND COMPRESSORS





AAF Line of Filters Offers Type and Size for Every Air Cleaning Need

CYCOIL OIL BATH AIR CLEANER

A heavy-duty oil bath cleaner that provides 4-way cleaning—impingement, scrubbing, cyclonic action and filtering. In this unit over 90% of the fine dust content in the air is trapped in oil and removed by centrifugal action before reaching the filter pads. Additional action of filtering pads plus positive oil circulation for self-cleaning action gives approximately 100% dust-free air. Write for Bulletin No. 130.

MULTI-DUTY TYPE CMS AIR FILTER

An automatic, self-cleaning filter designed to deliver a uniform volume of clean air under all conditions. Its operating resistance remains fixed when once established for a given dust concentration and requires no attention other than periodic inspection and the removal of sludge at regular intervals. For outdoor installation, filter is supplied with protective housing (as illustrated), including plenum chamber designed to dampen intake pulsations and distribute air flow uniformly over filter curtain. Ask for Bulletin 150.

TYPE "OC-H" FILTERS

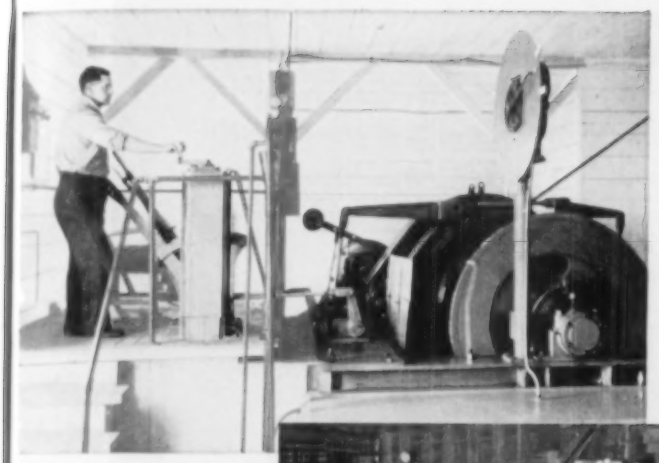
These filters are complete assemblies consisting of individual viscous impingement type cells and housings. Installation is made by merely bolting housings to flange on air intake pipe. For outdoor service, filters can be supplied with removable weather louvres, as illustrated. Type OC-H filters are recommended where dust to be removed consists principally of street dust, coke breeze, soot, etc. Ask for Bulletin No. 120.

AAF

American Air Filter
COMPANY, INC.
402 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

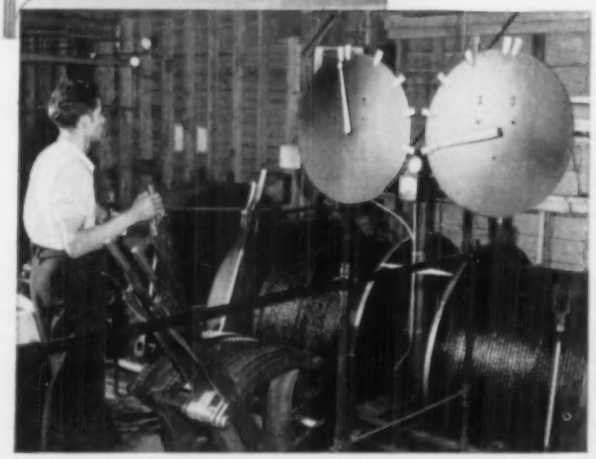
ELECTRIC MINE HOISTS

...by Canadian Ingersoll-Rand



Wherever you go, you find these sturdy smaller hoists at work. Like the larger hoists made by Canadian Ingersoll-Rand, every one of these smaller hoists is designed to meet a set of special requirements. This fact, plus Ingersoll-Rand's unique record of hoist engineering experience adds up to the safe, dependable hoist service famous among mining men all over Canada.

Call an Ingersoll-Rand man when you want to talk about hoists.



SOME FACTS ABOUT THESE SMALLER I-R HOISTS:

- *available in 30-inch to 60-inch drum diameters*
- *rope pulls of 5,000 to 14,000 pounds*
- *single or double drum machines with drum(s) keyed or clutched*
- *post-type main brakes on each drum with choice of brake lining material*
- *brakes and clutches operated by direct hand lever or fitted with either air or oil engine control*
- *brakes and clutches interlocked*
- *drums either plain or grooved*
- *gear-driven depth indicators*

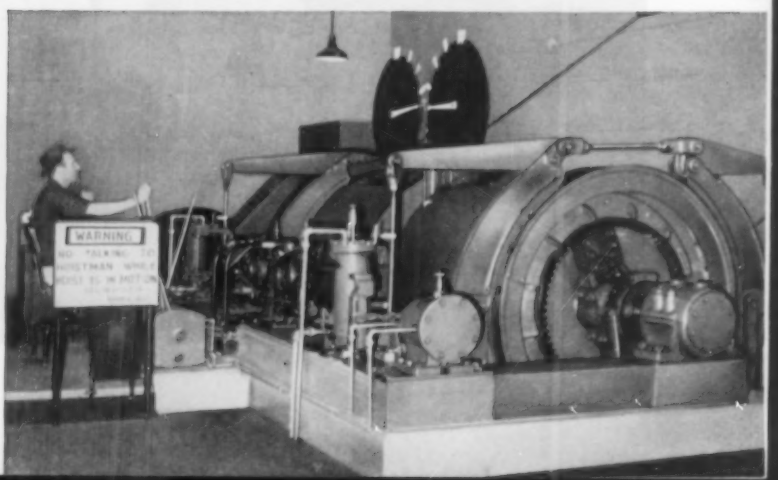
IR CANADA

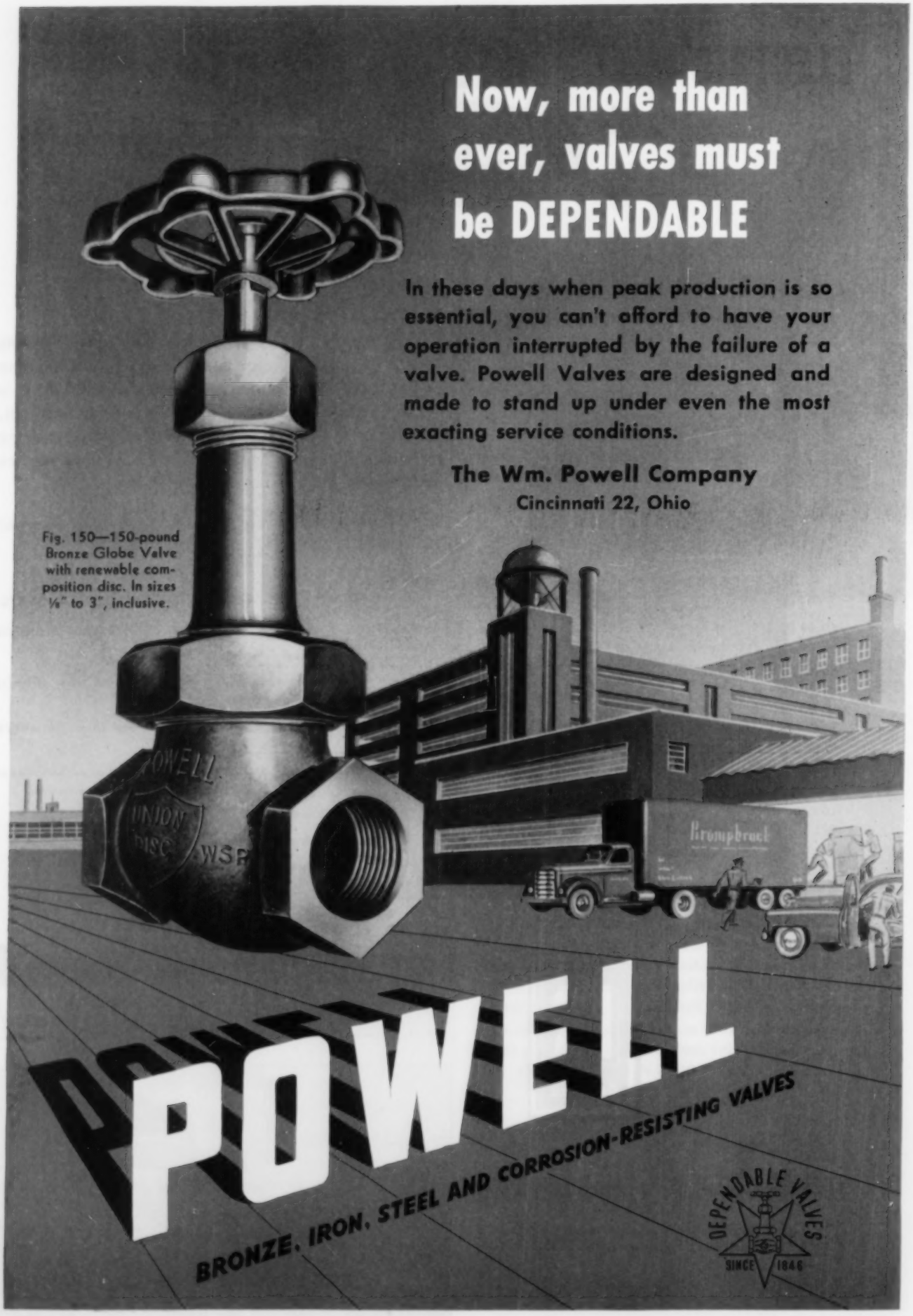
Canadian Ingersoll-Rand Company Limited

HEAD OFFICE - MONTREAL, QUE. ..... WORKS - SHERBROOKE, QUE.

BRANCH OFFICES: SYDNEY SHERBROOKE MONTREAL TORONTO KIRKLAND LAKE TIMMINS WINNIPEG CALGARY NELSON VANCOUVER

K-3




Now, more than ever, valves must be DEPENDABLE
In these days when peak production is so essential, you can't afford to have your operation interrupted by the failure of a valve. Powell Valves are designed and made to stand up under even the most exacting service conditions.
The Wm. Powell Company
Cincinnati 22, Ohio
Fig. 150—150-pound Bronze Globe Valve with renewable composition disc. In sizes ⅛" to 3", inclusive.
POWELL
UNION DISC
Brompton
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES
SINCE 1846

another slugger in the OUTPUT lineup

Now — taking its place in the outstanding line of Bucyrus-Erie heavy-duty quarry and mine excavators is the field-proved 4½-yard 110-B — a convertible shovel-dragline which can give you bigger output in rock, ore, or dirt at lower cost than any other machine of like capacity on the market today.

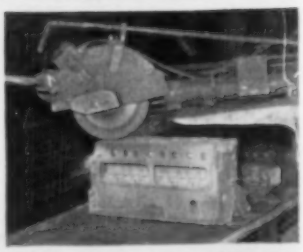
Like the larger 150-B (6-yard) and 190-B (8-yard) machines, the 110-B features Bucyrus-Erie's exclusive shovel front end. The strong, light two-section boom reduces weight and speeds digging cycle, yet provides ample strength for tough digging. Tubular dipper handle, free to rotate in saddle block, permits digging with one corner of dipper without introducing torsional strains. Powerful effective rope crowd reduces swing inertia because crowd machinery is located on revolving frame. And, twin-dual hoist ropes concentrate power where needed to pull dipper through toughest banks.

Before you buy any machine in the 4½-yard range, investigate the 110-B. It will give you consistently large ouput at lowest cost per yard. For detailed information, write today for Bulletin 110-B-1. 4L53C

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

3 ways CRYSTOLON* wheels add the "TOUCH OF GOLD" to gray iron grinding



1 In Norton CRYSTOLON wheels you get an abrasive with maximum hardness and sharpness for fast, economical grinding on a low-tensile-strength material like gray iron.

2 There's a CRYSTOLON wheel with a bond that's exactly right for every type of cleaning room job you do. That goes for everything — swing frame, floor stand or portable grinder — heavy or light grinding pressure, large or small contact areas, high or low speeds.

3 You can depend on CRYSTOLON wheels for consistent top performance — thanks to Norton's method of controlling grain spacing that assures uniform structure within wheels and from wheel to wheel.

That's how Norton CRYSTOLON wheels add value to gray iron castings as they do to everything they grind — providing the "Touch of Gold" that means lower cost grinding for *you*.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

Your Norton Distributor can help you

Besides his own practical experience in grinding applications, your Norton Distributor can always call in a Norton Abrasive Engineer. They will be glad to study your grinding jobs and make recommendations for more efficient, more economical cleaning room operation.

Ask your Norton Distributor for Booklet 1405, or write us direct. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Inc., Worcester 6, Massachusetts.

NORTON
ABRASIVES
Making better products to make other products better

W-1436

ON THE COVER

WE COULD perhaps dig up a few Indian legends about Lost Lake or find out how it acquired its name, and we can tell you that Mount Hood in the background is 11,253 feet high. However, the important thing about our cover picture to many readers is the message it conveys: "It's time to go fishin'."

•

IN THIS ISSUE

NATURE, like politics, makes strange bedfellows. Mica, feldspar and kaolin form a triumvirate that gives Spruce Pine, N. C., a place on the mineral map. All these nonmetallics are aluminum silicates, but their similarity ends there. Although they occur together, they differ widely in appearance, structure and characteristics.

With the possible exception of asbestos, mica is the most distinctive of all minerals. Composed of myriads of shiny plates or films that can be split into unbelievably thin slices, it just doesn't look like most other rocks. And, no matter how finely it is ground, it retains this peculiar structure. That is why paint containing it does a superlative covering job.

Feldspar, the most common crystalline rock, probably can be identified by few persons other than miners or mineralogy students. Kaolin, velvety soft to the touch and yet made up of minute crystalline particles, is a bit anomalous.

All in all, the leading Spruce Pine minerals are an interesting trio. Our leader is the first of two articles on the subject and on the scenic area they come from.

•

PEOPLE in the aerosol industry expect that 95 million of the "spray-on" units will be marketed this year—a 35-percent gain over the 1952 volume. Approximately half of the pressurized dispensers will contain materials such as shave cream, hair dressings, deodorants, burn remedies, etc., that are applied to the person. For aerosol history and general information see page 160.

•

IN A few years there won't be anybody around who can write from first-hand knowledge an article such as *Beans and Burros*, page 166. The author, A.A. Richie, now retired in California, spent most of his life searching for gold and working in mines. In his earlier years he competed in some of the hand drilling contests that were a feature of the holiday entertainment schedules of western mining camps.

Compressed Air Magazine

COPYRIGHT 1953 BY COMPRESSED AIR MAGAZINE COMPANY

VOLUME 58 **June, 1953** NUMBER 6

G. W. MORRISON, *Publisher*
C. H. VIVIAN, *Editor* J. W. YOUNG, *Director of Advertising*
ANNA M. HOFFMANN, *Associate Editor* J. J. KATARBA, *Business Mgr.*
J. C. PIERCE, *Assistant Editor* FRANCIS HARTMAN, *Circulation Mgr.*
A. W. LOOMIS, *Assistant Editor* WILLIAM HEINS, *Foreign Circulation Mgr.*
D. Y. MARSHALL, Europe, 243 Upper Thames St., London, E. C. 4.
F. A. McLEAN, Canada, New Birks Building, Montreal, Quebec.

EDITORIAL CONTENTS

The Spruce Pine Mineral Kingdom—*C. H. Vivian* 152
Pressure Packaging—*R. J. Nemmers* 160
This and That 165
Beans and Burros—*A. A. Richie* 166
New Box Car Unloaded with Aid of Air 168
Tunnelers Make Record at Niagara Falls—*H. R. Rice* 169
Editorial—Rhodes Centenary 171
Alcan Tunnelers Better Record Again 172
Wife of Leading Constructor Honored by Coast College 172
Pneumatic System Solves Dough-Dusting Problem 173
Heavy-duty Billet Shear Features Pneumatic Cylinders 173
Industrial Notes 174
Quotes from Here and There 177
Books and Industrial Literature 178

ADVERTISING CONTENTS

Adams Co., Inc., R. P. 31
Air-Maze Corporation 37
Allis-Chalmers Mfg. Co. 24
American Air Filter Co., Inc. 14
Armstrong Machine Works 41
Bearium Metals Corp. 41
Bethlehem Steel Company 4, 32
Bucyrus-Erie Company 17
Canadian Ingersoll-Rand Co., Ltd. 15
Cook Mfg. Co., Inc. C. Lee 29
Coppus Engineering Corp. 13
Crucible Steel Co. of America 45
Detroit Diesel Engine Division-General Motors 38
DeZurik Shower Company 39
Dollinger Corporation 3
duPont deNemours & Co., E. I. .. 11
Eimco Corporation, The 25, 26
Electric Machinery Mfg. Co. 7
Fluor Corporation, Ltd., The 5
General Electric Company 43, 44
Goodrich Company, The B.F. 22
Hansen Mfg. Co., The 42
Ingersoll-Rand Company 6, 27, 34, 3rd Cover
Kendall Controls Corporation 37
Koppers Company, Inc. 28
Lake Shore Engineering Co. 19
Madison-Kipp Corporation 8
Maxim Silencer Co., The 9
M-B Products 39
McCord Corporation 23
National Forge & Ordnance Co. 39, 40
Naylor Pipe Company 20
New Jersey Meter Company 41
Norton Company 18
Powell Company, The Wm. 16
Roebling's Sons Co., J. A. 12
Sarco Company 40
Sauerman Bros., Inc. 40
SKF Industries, Inc. 30
Texas Co., The ..... 2nd Cover
Timken Roller Bearing Co., The Back Cover
Victaulic Co. of America 21
Vogt Machine Co., Henry 33
Walworth Company 10
Westinghouse Electric Corp. .. 35, 36
Wood's Sons Co., T.B. 37

A monthly publication devoted to the many fields of endeavor in which compressed air serves useful purposes. Founded in 1896.

CCA Member Controlled Circulation Audit

Published by Compressed Air Magazine Co., G. W. MORRISON, *President;* C. H. VIVIAN, *Vice-President;* A. W. LOOMIS, *Vice-President;* J. W. YOUNG, *Secretary-Treasurer.*
Editorial, advertising, and publication offices, Phillipsburg, N. J.
New York City Office, 11 Broadway. L. H. GEYER, *Representative.*
Annual subscription: U.S., $3.00, foreign, $3.50. Single copies, 35 cents.
COMPRESSED AIR MAGAZINE is on file in many libraries and is indexed in Industrial Arts Index and in Engineering Index.

SUPERLATIVE SCENERY

Tourists drive close to the top of Grandfather Mountain, then mount steps (No. 1), cross a 228-foot suspension bridge and finally reach the crest. Once there, they look out upon the vista shown in No. 2. Motorists may reach the Spruce Pine area over the high-level Blue Ridge Parkway from the North. A stretch of it is seen in No. 3. Close by, in North Carolina, is the scene pictured in No. 4.

The Spruce Pine Mineral Kingdom

Small Section in North Carolina Mountains is Big Producer of Three Nonmetallic Minerals

C. H. Vivian

Part 1

LOCATION MAP

This is Mayland, a name coined by adding the initials of Mitchell, Avery and Yancey to the word "land." It is the mica and feldspar capital of the nation and also yields much of our kaolin or china clay.

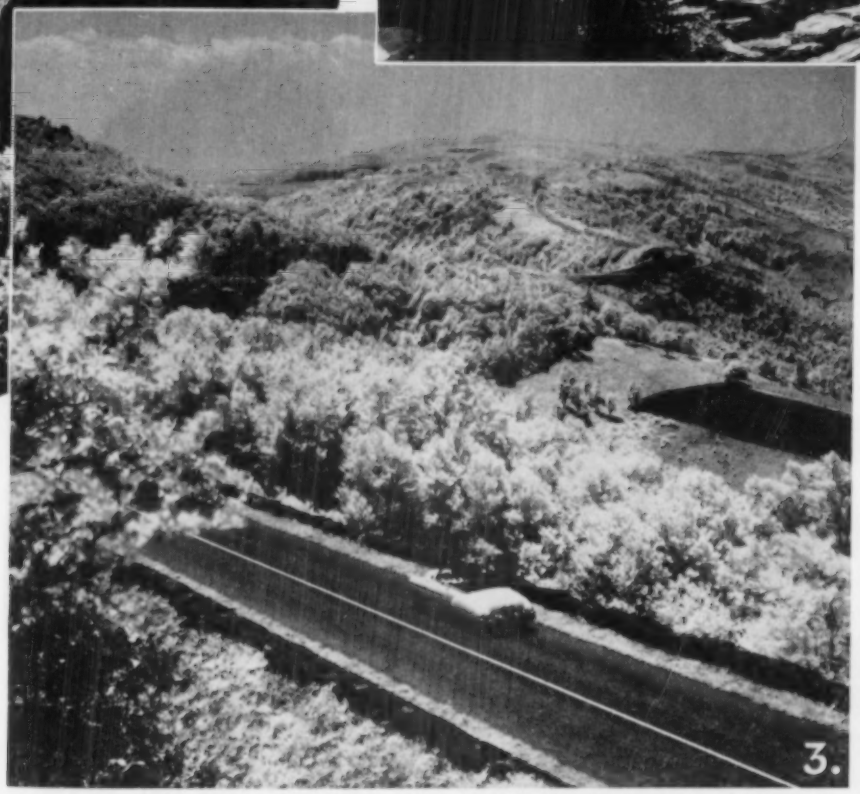
SINCE 1917, North Carolina has produced more feldspar and mica than any other state and its output of sheet mica has amounted to 90 percent of the nation's total. About 90 percent of its feldspar and 75 percent of its mica have come from the Spruce Pine district, an area of some 250 square miles in Mitchell, Avery and Yancey counties. It is in the Blue Ridge Mountains near the Tennessee boundary and is an upland section of great scenic appeal and desirable climate.

The three counties have a combined population of around 50,000, approximately 3100 of whom are currently employed in the nonmetallic-mining industry, which is a leading source of income. At times in the past when mineral production was slack, textile mills were built to take advantage of the surplus labor and now give work to some 1300 persons. Nationally known concerns such as Robbins, Duplan, Glen Raven and American Thread are among them.

About 85 percent of the people live on farms, and there are few towns. In some years the burley tobacco crop yields up to $1,500,000 and there is a thriving and growing dairy industry. Lumbering and allied pursuits occupy an average of 200 persons, one phase of these activities being the seasonal shipping of great quantities of roots of laurel and rhododendron, both of which grow profusely on the well-watered mountain slopes. At the height of the season sales run up to $75,000 a week.

The largest town in the district and the mining and trading center is Spruce Pine with a population of about 2500. Next in importance is Burnsville, 16 miles away. The altitude of the region ranges from a low of around 2150 feet to 6684 feet at the tip of Mount Mitchell, highest peak east of the Mississippi River. The principal stream is the Toe River, the north and south branches of which come together near Micaville, a name that speaks for itself. About two-thirds of the area is wooded. At lower elevations rocks have undergone exten-

NATIONAL PARK SERVICE PHOTO



N. C. DEPT. OF CONSERVATION & DEVELOPMENT PHOTOS

sive weathering and outcrops are scarce, but in the higher reaches they are plentiful and hundreds of them have been prospected for commercial minerals.

The mineralized belt is in the form of an ellipse, approximately 10x25 miles in dimensions. In addition to feldspar and mica, kaolin is regularly produced, as well as quartz sand, the latter being a by-product of feldspar milling operations. Other nonmetallics are shipped at times, an example being vermiculite, a variety of mica. Apart from the commercial side of the mineral industry, the district is a paradise for the mineralogist or gem collector who is more interested in finding an unusual or beautiful specimen of stone to be kept and displayed than he is in coming across a deposit large enough to be mined.

At least 250 distinct minerals have been found there, and a good many of them are exhibited in Linton B. Greene's collection at Spruce Pine that is viewed each year by more tourists who are gradually "discovering" the hitherto little-known community. In this mineral kingdom, Mr. Greene collected two tons of beryl for the U. S. Government during the last war. Emerald and aquamarine, gem forms of beryl, are not uncommon, and the only emerald mine in the nation was for a time operated near Little Switzerland, a name that betokens the character of the surrounding country. Some columbite and pitchblende, the latter a uranium ore, have likewise been uncovered, but not in quantities big enough to stir up excitement.

In many respects, Spruce Pine resembles some of our western mining camps. It is laid out chiefly on the facing sides of the Toe River Valley, and the main business section consists of two streets, each about six blocks long, strung along a rather steeply sloping hillside. The upper one, Oak, which is, incidentally, part of a through highway, is approximately straight, but the lower one, Locust, veers upward at each end and joins its neighbor. Thus the two form a bow-like figure. The strip of land between Locust Street and the river is nearer to being level than any other in the section but is devoid of stores because the Clinchfield Railroad tracks were laid on it before there was much of a town. The Clinchfield, a carrier with 302 miles of trackage, runs southward from Elkhorn City, Ky., to Spartanburg, S. C., mostly through mountainous terrain.

On the opposite side of Locust Street stores have won a foothold by dint of much hillside excavating. At the rear of some of them you can climb a couple of flights of stairs and find yourself in another store fronting on Oak Street some 25 or 30 feet higher than its companion. Several rather steep cross links connect the two main thoroughfares, which the local residents always refer to as the "upper" and "lower" streets.

On the hillward side of Oak Street are other business places that entailed the heaviest digging of any in the district. Back of them are sheer bluffs where the fast-rising ground was cut away, and in at least one instance a sizable slice of such a bank sloughed off

SHEET-MICA BUYING DEPOT

To stimulate domestic mining, the U.S. Government is paying much more for sheet mica mined in this country than the imported mineral sells for. One of the three buying depots established is in Spruce Pine and it serves five southern states. Mica brought there is evaluated immediately and paid for within four days: Shown here are typical scenes at the depot. The trimmed sheet "ruby" mica in the cartons pictured at the top-right netted its producers, Young and Wilson, $3200. Claude Wilson, a partner, is on the right, and next to him is Ralph Young, son of the other firm member. On the left is Mrs. Vista Buchanan, who had charge of the "sheeters" and trimmers who prepared the mica for marketing. The first step is to weigh each lot (top-left). Then samples of each lot are inspected by experts, who examine it under brilliant artificial daylight produced by fluorescent lamps (above). The table top is painted with the whitest enamel obtainable. W .S. Flynt, manager of the depot, is at the extreme left. Next to him is Carl Buchanan, head buyer. On the say-so of these men are written checks for large sums.

and crushed the rear of the building beneath it as though it were an eggshell. The necessity of moving so much earth and rock in order to erect commercial structures has made it expensive to embark upon a mercantile pursuit in the heart of Spruce Pine. The bulldozer has alleviated the muck-shifting problem to some extent, but it is still a serious one, and the few unoccupied plots along the business streets that have been leveled are priced as high as $400 per front foot. The topography makes parking places scarcer than in many large cities; yet Spruce Pine is so hospitable to tourists that it imposes no time restrictions on their cars.

The similarity to western mining areas extends to the surrounding hillsides, which are well-scarred with new and old workings ranging from prospectors' shallow pockmarks to deep gashes from which sizable amounts of mineral have been taken. Commercially, Spruce Pine is an even more progressive mining community than some of its western counterparts. A man who has lived in different parts of the country where feldspar is produced states that some mining supplies that are not immediately available in such a prominent center of the industry as Denver, Colo., can be bought "off the shelf" in Spruce Pine hardware stores. The Mitchell Distributing Company, which handles leading brands of heavy-duty equipment such as air compressors, rock drills, bulldozers, hoists, etc., maintains such a large stock of both new machines and spare parts that its customers are very seldom called upon to wait for anything along those lines.

The town also belies its size in some other respects. Although little above the village class so far as population is concerned, there is enough construction going on to support a ready-mix concrete plant and an asphalt mixing plant. Also, it has recently been singled out by the Bell Telephone System as an area for testing the most modern of dial systems. Instituted at a cost of around $400,000, this will soon make it possible for Spruce Pine people to dial any city having similar equipment. It will be a considerable change from cranking to get central, as they have been doing.

The geology of the district is somewhat involved. There is evidence that

the mountains were originally higher than they are now, possibly as lofty as 21,000 feet. Eons of erosion have reduced them to their present comparatively low elevations. Some of the material that was removed was, according to one theory, carried into adjacent states and gave rise to secondary kaolin deposits in Georgia, South Carolina and Florida. During the passage of these unnumbered centuries the original crustal rocks, which may have been of either sedimentary or igneous genesis, were folded, twisted and tilted by enormous seismic pressure and heat and given a foliated structure. By reason of their composition, the remade or metamorphosed rocks fall into the categories of mica schists and gneisses, in which the prevailing minerals are quartz, feldspar, mica and hornblende.

This profoundly altered complex of Pre-Cambrian rocks underlies most of the district. However, in relatively recent geological times it was further complicated by numerous intrusions of igneous or molten rocks. The earlier ones were of the so-called basic types, on the dark side, and some of them were, in turn, altered into soapstone and talc and similar minerals. More recently, and cutting through all the formations mentioned, came intrusions of granitic rocks composed of feldspar, quartz and mica only. These take the form of irregular rounded masses called stocks that range in width from a few 100 yards to 2 miles; and there are also narrower, steeply dipping sheet-like dikes or sills or stringers. It is believed that the source of all of them is a large underground mass, as yet unexposed. A characteristic of this rock is that, unlike a true granite, it is virtually lacking in the black minerals, and for that reason is called alaskite. This shortcoming has an important bearing on the mineral industry of the area.

Ordinary granite contains considerable black mica, called biotite, which gets its color from iron. It so happens that iron renders mica useless for some electrical applications, which rules out biotite for that purpose. Here, however, Nature was kind enough to omit most of the iron, and that makes the Spruce Pine mica the most desirable of any so far discovered in this country. Moreover, there is little iron to stain the feldspar and kaolin taken from the same areas, and that also means the difference between a desirable product and an inacceptable one, for some uses.

Geologists of the Tennessee Valley Authority, who have done considerable work throughout the area, think that alaskite is a distinct species of rock and not just a variety of granite. In addition to the alaskite intrusions, there came others of pegmatite in the form of dikes, lenses and irregular elongated masses from an inch to 100 feet or more wide and from a few feet to a mile long. All commercial mining is closely associated with the two types of intrusions. Both feldspar and mica were originally present in the alaskite, and feldspar is a principal constituent of pegmatite. Traditionally, it has been the belief that kaolin was formed in most cases by the alteration of feldspar, although in recent years some authorities have taken exception to that explanation of its origin.

The minerals shipped from the district in 1952 had a value of between $7,000,000 and $8,000,000. Feldspar led with an estimated worth of $3,600,000. The mica output accounted for returns of probably $2,500,000, of which $2,000,000 was from scrap and ground varieties and $500,000 from sheet material. Kaolin, quartz, sand, vermiculite and miscellaneous other minerals made up the balance.

Mica is a Latin word meaning crumb and was applied to the mineral by reason of its fragile, crumbling nature when in thin sheets. Man first prized it because it, or some varieties at least, let light through. Consequently it served as stove windows and lamp chimneys in the days before heat-resistant glass was available. It was commonly called isinglass, a name derived from *Huysenblas*, the Dutch term for the translucent bladder of the sturgeon. When Dutch fishermen found a stone with the same light-passing quality, they gave it the same name. In Russia it was called muscovy glass, and from that comes our word muscovite for the clear variety of the mineral, which is most prized for electrical applications.

There are nine mica minerals, of which five are used in industry. They are composed mainly of the silicates of potassium, aluminum and magnesium. Muscovite, the potassium or "white" mica, and phlogopite, the magnesium or "amber" mica, have such a perfect basal cleavage that the crystals can be split into sheets or films 0.0001 inch or less in thickness. The better grades of these sheets are so strong and flexible that they may be wrapped around a mandrel ⅛ inch in diameter without rupturing. Both types have high dielectric strength; that is, they can withstand high voltages without puncturing. Muscovite can be employed for electrical purposes where the temperature does not exceed 1000°F and phlogopite for temperatures up to 1850°F. The latter enters into the manufacture of spark plugs for aviation engines, to mention one application.

Mica seems to have been the first mineral mined commercially in the Spruce Pine district. That it was dug by the Indians, who used it for ornamentation,

STATUE IN BURNSVILLE

Having more elbow room than Spruce Pine, Burnsville can indulge in some civic embellishments. Here is a statue erected in memory of the man who gave the town its name. He was Otway Burns, called the "foremost North Carolina man in the War of 1812-15." At the right is the Nu-Wray Inn, owned by the descendants of one of the pioneer mica-mining families.

is indicated by findings in mounds where the aborigines lived. Its initial production in America by white men was in New Hampshire in 1803, and that was followed by opening deposits in several other states. Credit for the first commercial development of mica in the Spruce Pine area is given to Elisha Clapp. Shortly after the Civil War, so the story goes, he was riding through the Blue Ridge Mountains on horseback and stopped overnight at the home of Dave Patton in Johnson City, Tenn. Noticing a large sheet of clear mica on the mantel of the fireplace and knowing something of the material's value, he learned upon inquiry that it came from Mitchell County, North Carolina.

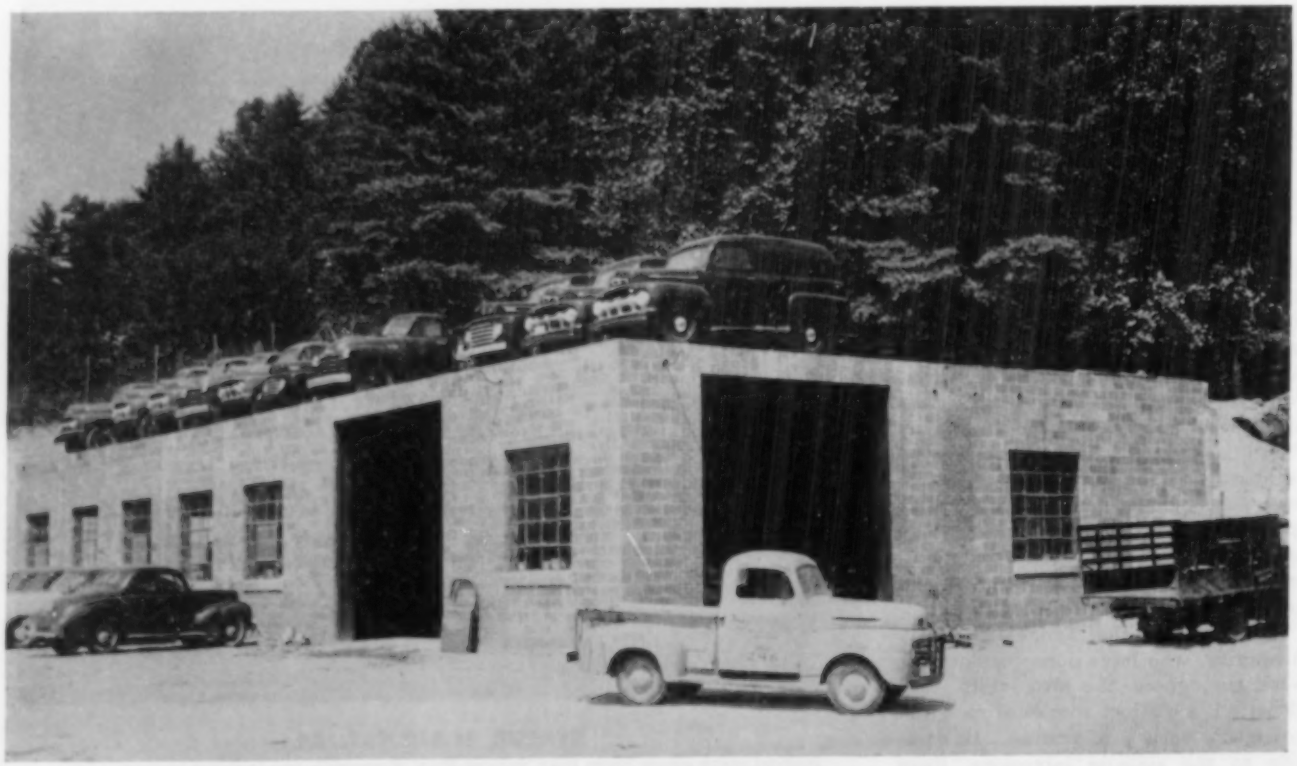
Clapp went there, located a deposit of it, negotiated for its purchase from the landowner and then sent for John G. Heap, his partner in a hardware business at Huntsville, Ala. They acquired other properties and began processing not only the material they produced but also that from the properties of others who had followed their lead in mining it. In a few years they were supplying just about all the mica used as stove windows in this country and Canada. At one time they controlled about 30 mines, and were almost the only mica producers in North Carolina. Heap eventually sold his interest and Clapp passed his on to his daughter, the late Mrs. Ella Clapp Thompson, who was born at a mica mine. Her early associations prompted her to study geology and mineralogy, but she also obtained a law degree from Fordham University in New York City and served two years as an assistant United States attorney. Some of her mica holdings were activated during World War II, and she took a great personal interest in the operations. They are now being opened again.

There are two kinds of mica mined and processed: sheet and fine ground. Sheet-mica mining booms during times of national emergency, when it is high on the list of strategic minerals because of its use in electrical and electronic devices. Between emergencies we get most of our supply from other countries, mainly India, where the low wage scale permits its production at figures with which we cannot compete. Hundreds of sheet-mica properties, mostly 1- to 5-man propositions, were worked during World War II, but by 1946 activity had subsided. The Korean situation again revived it.

Last July the General Services Administration established a purchasing depot at Spruce Pine (others were opened at Franklin, N. H., and Custer, S. D.) following the announcement on March 14, 1952, of a long-range program of stockpiling domestic muscovite mica to encourage discovery and development of the critical mineral. The program will continue until June 30, 1955, or until the equivalent of 25,000 short tons of hand-cobbed mica has been bought. The price paid for hand-cobbed raw mica is $600 per short ton. When processed —that is, split or "rifted" into films about 0.007 inch thick and trimmed to remove any bad spots—it brings from $2 to $70 per pound, depending on the grade. Specifications are long and complicated. There are twelve distinct gradations in size, running from pieces having an area of 100 square inches or more and a minimum side dimension of 4 inches down to those of 1 square inch with a minimum side dimension of ¾ inch. There are also ten gradations in visual quality, ranging from clear through slightly stained to fair-, good-, heavy-, and black-stained.

Up to the end of March, the Spruce Pine depot had obtained almost $1,000,000 worth of mica at an average price of around $15 per pound. With more properties being opened up all the while, it was estimated that buying would reach a pace of $2,500,000 per year by midsummer. The depot is the purchasing agency for mica produced in North Carolina, South Carolina, Virginia, Georgia and Alabama, but about 90 percent of the total bought during the first eight months came from North Carolina and Georgia, with the Spruce Pine district contributing around 80 percent.

Approximately 1000 participation numbers have been issued, meaning that many persons have been certified as eligible to sell mica at the depot. Although the latter is authorized to purchase block or book mica, all that has been offered so far has been split and



SOLVING THE PARKING PROBLEM

Because of its side-hill location, Spruce Pine is short on parking space. For a time the Ford agency (above) used the top of its building for that purpose. But since another story was added the roof is no longer accessible.

MOUNT MITCHELL

From the Blue Ridge Parkway a 2-lane highway leads 4 miles to within a few hundred feet of the summit of Mt. Mitchell, which has been visited by as many as 13,000 persons in one day. The peak was named for Dr. Elisha Mitchell, former professor of geology and mineralogy at the University of North Carolina, who lost his life near the crest in June, 1857.

trimmed. The miners usually bring it in in boxes or cartons. Each is weighed and a representative sample is taken from it. These are examined in sight of the owner by experienced inspectors who are so skillful that they are able to classify the mineral into the various grades solely by looking at it. The value of the lot is determined according to their appraisal of the boxes, and within four days, as a rule, the seller gets a settlement check from the Emergency Procurement Service district office in Atlanta, Ga.

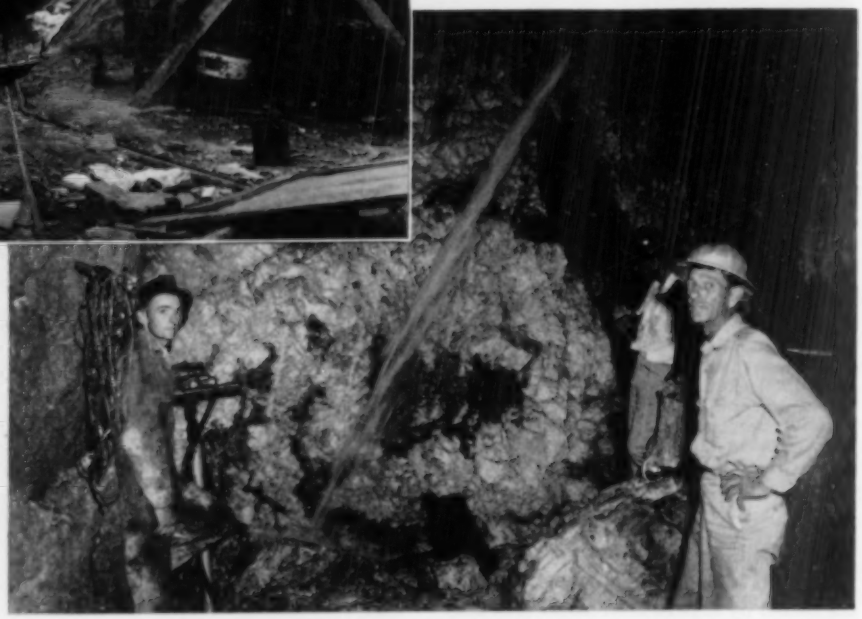
The Government is paying considerably higher prices than mica of foreign origin commands in an effort to build up domestic sources of supply. These attractive returns naturally are tempting to unscrupulous possessors of imported mica, and once in a while they offer some of it for sale. To the uninitiated, it is just like the native product in appearance, but the practiced eyes of the inspectors spot the difference in a matter of seconds. Often they can even tell from which country it came. One tricky individual sold some India mica to an accredited local miner without informing him of its foreign origin. When the new owner innocently offered it to the depot, it was immediately detected and rejected. The miner was exonerated of blame, but learned a costly lesson.

The mica the depot buys goes into a large adjoining room for grading, an operation that is handled under contract by L. M. Carpenter & Associates. Girls who have previously worked with mica in local processing plants do the grading. Each one deals with a certain size of splittings. Under bright artificial daylight from fluorescent lamps, each piece is scrutinized while held a few inches above a tabletop as white as the whitest paint can make it. Each lot passes through the department identified only by number. After the girls have separated the consignment into the various grades, Government men spot check it and compare the results obtained with the original appraisal made by the buying experts. As a rule, there is amazingly little difference.

Graded mica is packed in boxes containing 100 pounds each and shipped to one of the Government's stockpile depots. From there it is sold to authorized users, but at a considerably lower price than Uncle Sam paid for it. In fact, Walter S. Flynt, superintendent of the Spruce Pine station, estimates that the United States will get back a little less than 40 cents of every dollar it pays out. Even so, he is of the opinion that only about two percent of the miners now make a worth-while profit. He calls mica mining a "very precarious vocation, financially and physically."

The mica interests are seeking liberalization of the buying specifications so that certain varieties of the mineral now excluded from purchase will be included. So-called ruby mica from India has long been the standard of quality throughout the world, and only material comparable to it has been accepted by the Government, although North Carolina producers have contended that their grades described as green and clear are just as good as ruby for practically all purposes.

In fact, what the local mica people call the "myth" of ruby mica's superiority was pretty well dispelled a few years ago when a committee from the U. S. Senate, headed by then Senator Harry S. Truman, reported that there was no basis for the prejudice against the so-called "stained" mica of the Spruce Pine area because the coloration was not caused by iron, which admittedly decreases the dielectric properties of the mineral. For a time, the Government bought green mica for making up electrical insulating parts, and local fabricators used considerable quantities of it. But when the war ended, and foreign mica came back, it became increasingly difficult for local miners to stay in business against that competition, and sheet-



ISOM MICA MINE

This property has been worked sporadically since 1874 from a vertical shaft. When the present operators took over a few months ago the mine was filled with water. They went down the hillside a few hundred feet and drove an adit (left) underneath the former workings. Next they drilled a hole overhead to tap the water, which can be seen spurting across the picture below. In front of the man at the left is an Ingersoll-Rand Type J-50 Jackhamer mounted on a Jackleg.

mica mining gradually sank back into the doldrums. When it was recently revived by Government buying the old "myth" somehow reasserted itself.

Around 30 mines in the Spruce Pine area have produced green and clear mica. If these species were to be ruled acceptable, it is expected that the local yield would jump to from three to five times its current volume and that 700 persons in the section would be mining sheet mica within a few months.

As a part of the national mica-reserve program, the Government also has been offering financial aid to persons who can give evidence of having located promising prospects. During 1952, Defense Minerals Exploration Administration received 89 applications for assistance of this kind and awarded 39 contracts totaling $264,230. Under the prevailing arrangement, Uncle Sam pays 90 percent of the actual exploration costs, but recovers the loans from prospects that develop into producers.

Prior to instituting its domestic buying plan, the Government carried on an extensive stockpiling program by the purchase of foreign mica. In 1951 alone it acquired 18.3 million pounds of Indian block and film (split) mica, and that was sufficient to meet the current reserve-supply objective. In 1952, importations were scaled to provide enough for the year's needs and amounted to something more than 4,000,000 pounds. Likewise during 1952 the GSA contracted with eleven importers to buy over a 3-year period up to 4,557,250 pounds of muscovite block and film mica from India, Brazil, Angola and Tanganyika.

During former periods of sheet-mica mining activity in the Spruce Pine district, its fabrication into various useful forms created a considerable pool of skilled labor. The establishments employ around 450 people, and their products range from tiny washers for radio, radar and television apparatus to large built-up insulating boards that go into motors, generators and other electrical equipment.

For many years efforts have been made to substitute synthetic materials for sheet mica or to build up pieces to the required size from scrap mica and some kind of binder. Several types of this kind are now available, and they may find wider application. That the Government does not consider them to be wholly acceptable replacements for natural sheet mica is apparent from the continuation of the mica-buying programs.

The traditional use of mica in electrical capacitors or condensers is threatened by a microfilm glass being developed by Corning Glass Works for manufacture on a mass-production basis. Another matter that will no doubt affect sheet mica adversely is the growing acceptance of transistors in place of conventional electronic tubes. In the transistor, a particle of the rare metal germanium is embedded in a plastic shell about the size of a kernel of corn. The metal controls the electrons in solids in much the same way a tube handles them in a vacuum. Although the price of germanium ranges between that of gold and platinum, the amount needed for a transistor is so minute that it costs only a penny or two.

Sheet mica is invariably found in pegmatite dikes, usually along the edges. As the dikes follow irregular courses, the mine workings must do likewise and cannot be laid out in a systematic pattern. The spotty occurrence of mica calls for cautious drilling and shooting. Care must be taken not to drill through it or to place powder charges where they will shatter it. Instead, when a "book" or pocket is located, it is surrounded by fairly closely spaced holes, which are lightly loaded with 40 percent dynamite. After the book has been blasted loose, it must be loaded by hand as there is no machine that can do it without damaging the mineral structure.

Sheet-mica mining is generally carried on by small, independent groups rather than large, established mining concerns. The members may band together and lease a promising property or one that has produced well during previous periods of activity. Again, one of the party may own a property and take others in with him to help finance the operation or to contribute labor on some sort of a share basis. It is a tedious type of mining at the best, following the unpredictable course of the host feldspar. Drifts are

usually only wide enough to accommodate one man.

Most of the workings go underground, some as much as 500 feet. Means of entry may be by a vertical or an inclined shaft or an adit, depending on the topography of the surface and how the pegmatite is disposed with reference to it. In a vertical shaft, either a single- or 2-drum gasoline-driven hoist with a lifting capacity of 1600 or 2000 pounds is apt to be used and commonly handles a bucket of 1000 pounds capacity. In an inclined shaft, a car that will hold the same weight of material runs on narrow-gauge rails. For drilling, light Jackhamers such as J-40's or J-50's are utilized, with air for operating them coming from either an 85-cfm or a 105-cfm Mobilair rotary compressor powered by a gasoline engine. Meager data on yield in North Carolina indicate that from 6 to 27 pounds of mica is recovered per ton of rock broken. In New England, the run-of-mine mica is 28 pounds a ton.

Most spectacular of the rehabilitated old mines is the Isom, named for a Northerner who worked it for a while shortly after it was opened around 1874. It is located in Yancey County near the headwaters of Cattail Creek and at an elevation of about 5000 feet, which perhaps makes it the highest mine east of the Mississippi River. In the early days all supplies were packed in by mules. Later a switchback-type narrow-gauge logging railroad was run in. Its tracks have long since been torn up, but the roadbed serves as a haulageway.

The Isom is now being operated by three Burnsville men, Mark and Yates Bennett and W. J. Godfrey. During the several periods of past production, a vertical shaft was progressively deepened to 225 feet, and in World War II days it was widened to 35 feet across the top. When the present operators took over in 1951 and beheld the water-filled workings they were uncertain how best to proceed. They asked the U. S. Bureau of Mines for advice, and K. B. Teague, a Bureau field engineer, inspected the property and recommended driving an adit underneath the old workings from a point down the hill.

CARVING A HIGHWAY

In this country of ups and downs, roadbuilders have to cope with much rock. Two Ingersoll-Rand wagon drills are shown here putting in blast holes during the construction of the Roan Mountain road.

The project was undertaken and entailed 475 linear feet of costly tunneling for which an exploratory loan was granted by the Defense Minerals Administration. The access road was put in shape for taking in machinery, and a bulldozer opened the approach cut for the adit so the crews could get their heading underground before the winter of 1951 closed in on them. The 7x9-foot bore was pushed through solid rock containing 30 percent kyanite by means of two column-mounted Ingersoll-Rand Jackhamers supplied with air by an I-R 105-cfm portable compressor.

The adit was driven slightly upgrade to provide drainage, and its roof lay 7 feet beneath the bottommost of the old workings. Sound rock intervened and there was no inflow of water. As the mica-bearing feldspar had already been entered and was wider and more productive of high-quality ruby-variety mica than the ground previously opened above, the miners advanced in the formation for about 35 feet before turning their attention to the reservoir overhead. Then they drilled a hole on an angle into the old workings, and in about ten days the shaft was completely unwatered. A 3x3-foot raise was next driven to connect the two openings. This insures a natural flow of ventilating air through the adit and permits delivering water to the rock drills by gravity.

MECCA OF MINERALOGISTS

More than 250 different minerals have been found in the area, which is visited by many gem hunters and geologists. Headquarters for these collectors and students is Linton B. Greene's shop in Spruce Pine. State legislation has been enacted to finance the erection of a mineral museum on land provided by the National Park Service alongside the Blue Ridge Parkway, which passes within a few miles of Spruce Pine. Manufacturers who process the commercial minerals of the district will provide permanent exhibits of their products, and a room will be set aside as a workshop for the use of visiting mineralogists and "gemologists."

The concluding installment of this article will appear in the next issue.

PRESSURE PACKAGING

Everything from Insecticides to Whipped Cream Now Dispensed by Handy Aerosols

R. J. Nemmers

PRESSURE packaging, one of the lustiest infants of the past two decades, has caught the capricious eye of the American public and grown into a major industry. People are flocking to buy the conveniently put up products that dispense themselves at the touch of a button, and many purchasers wonder what makes them "go" and what processes are behind the little "bombs."

The package is usually made up of a metal cylinder under pressure, and of a suitable valve for releasing the contents—a mixture of liquefied gas and the substance to be dispensed. There are essentially three kinds: one that is generally used for space deodorants and insecticides and that produces a true aerosol;* another that, like a compressed-air gun, sprays body deodorants, perfumes, germicides, paints, varnishes or other protective coatings; and the foam type which dispenses whipped cream, shaving lather, shampoos, and the like.

One of the earliest experiments with pressure packaging was conducted in 1932 when an insecticide was put in a container with liquid carbon dioxide. To withstand the 815 psi absolute pressure of the gas at normal room temperature of 70°F, the can had to be made of such thick metal that it was overly heavy and clumsy and was nothing more than a laboratory curiosity.

In 1935, Dr. Charles A. Goetz, then of the Department of Chemistry at the University of Illinois, got the idea of packaging cream and whipping it with compressed gases. His original model was a pint cylinder—a reconstructed soda siphon—in which he poured half a pint of fresh cream. He charged his dispenser in the same way a soda siphon is charged—by connecting it to a source of compressed gas and shaking the container. About one-twelfth of an ounce of gas was taken up by the cream and a like amount filled the void in the can. When the mixture was vented to atmosphere, Goetz found that he had produced a fluffy cream—one that occupied approximately three times the volume of the plain cream. A housewife, whipping her own, increases the volume about one and a half times.

In a search for a suitable gas that would be nontoxic and leave no odor or taste in the cream, Doctor Goetz finally settled on nitrous oxide, the laughing gas of the dental profession. His development, however, was forced to wait until after World War II and the arrival of a suitable container that would permit mass distribution in the home of his "Instant Whip." But it remained for the U. S. Department of Agriculture, in its search for newer and better insecticides and dispensers, to give the infant industry its final impetus.

During World War II, the department, in conjunction with engineers of the Westinghouse Electric Corporation, produced the first commercially practical aerosol insecticide and dispenser. This bug bomb, as the men of the Armed Forces called it, was intended primarily for use against malarial mosquitoes in the South Pacific. It proved so effective against almost all pests, however, that the application of this anti-insect "artillery" was extended to virtually all the

MILADY'S MIDGET

This tiny container for pressure-packaged cosmetics (right), developed by the American Can Company, is only 2⅛ inches in diameter and 4¼ inches high. Attractively finished in colors, it does not look out of place on the dressing table.

CANNED "SNOW"

The young lady is making her dream of a white Christmas come true. The pressure-packaged snow also comes in assorted colors to satisfy those who long for a rainbow-hued Yuletide. In a container of this type the propellant also acts as a carrier or vehicle for the snow, which is in flake form. The user shakes the can, then pushes the button.

*Although the word "aerosol" has become almost generic in its application to products dispensed by pressure packages, it is not always the correct term to use. An aerosol, as defined by Webster, is a colloid—a fine solid or liquid in suspension in air or gas—that might more properly be referred to as smoke or fog. As the end products may be in the form of a spray or foam, the name is at times inappropriate.

IT THWARTS RAIN

In addition to protecting the feet of foolhardy rainy-day golfers, the little can of Gard, above, will waterproof fabrics and felt hats. If properly applied, it will even make suede leathers repel water, something that has hitherto been difficult to accomplish. Similarly, the ignition system of the family car can be safeguarded against the risk of being drowned by applying Sherolite, as shown at the left. Because this fast-drying liquid has high dielectric strength it prevents short circuits and voltage loss through leakage across many of the contacts in modern autos.

service branches at home and abroad.

The first bug bombs were heavy, high-pressure throw-away units made of brazed steel to withstand a pressure of 70 psi (at 70°F). Later a refillable container was developed to resist the same pressure. This package was carried over into the retail-sales field after the war. (Its market was already well established, first by the return of the thousands of members of the Armed Forces who had used it and, second, by the publicity given the then new DDT in the press).

The selling price was almost prohibitively high—around $4 for a bomb that contained 16 ounces of the insect killer. Refills cost about half as much. Although the dispenser enjoyed a brisk market in the flush days immediately after the conflict, it was recognized that a cheaper container would have to be devised if the industry was to keep on flourishing. This led to a slightly less expensive type (15-ounce $3 unit) that was not refillable.

At this critical time it was discovered that effective aerosol insecticides could be packaged at pressures of around 40 psig. This made it possible to use containers of thinner metals, much the same in weight and form as throw-away beer cans, and brought about reductions in price of as much as 75 percent in many cases.

But before advantage could be taken of the cost saving, special rulings covering testing and shipment of these packages had to be obtained from the Interstate Commerce Commission, which controls the transportation of gases in excess of 25 psi pressure. Without going into the involved specifications of these regulations, suffice it to say that both the shipper and the ultimate consumer are protected against defective containers by means of a process to be described later.

With the introduction of the single-trip or throw-away dispenser and relaxing of the controls governing its use, pressure packaging has been applied to a long and ever-growing list of products. Although most things that could be canned in this way are still available in ordinary containers, the fact that the

American public prefers the handier type is attested to by the multimillion-dollar sales of pressure-packaged products last year. To list them all would require many pages; but some of the more novel and intriguing applications will be dealt with and illustrated.

In the cosmetics field, foaming shampoos and creams have made their appearance all dolled up in attractive cans that look well on the dressing table. Interesting advances have been announced in the department of medicine, with the promise of more to come. The U. S. Air Force medical staff is testing a transparent dressing for wounds. Called Aeroplast, it is simply sprayed on from a handy, sterile pressurized container. Among its advantages over gauze dressings are ease of application; transparency, which allows inspection of a wound without disturbing the dressing; and indefinite storage without resterilization, as is required in the case of gauze. Another inherent characteristic is that it adheres only to dry, healthy skin so that the body fluids can do their healing work unhampered in the covered wound. Aeroplast was developed by the Air Force in conjunction with Protective Treatments, Inc., Dayton, Ohio.

Another spray, recently released for domestic consumption, has gained widespread recognition among members of the medical profession because it purifies and sweetens the air in closed rooms. Known as Ozium, it is a mixture of propylene and triethylene glycols that are known for their bactericidal properties and is propelled by a gaseous carrier when pressure is released. Ozium is manufactured by Woodlets, Inc. Portland, Pa.

Push-button paint or enamel dispensers, a development of the Sprayon Products Corporation of Cleveland, Ohio, are a solution of a problem that has long plagued manufacturers; that is, the eradication of nicks and scratches on finished products after they have left the factory. With a little kit of the same paints or finishes applied originally, it is possible to do an expert touch-up job at low cost. While suitable for small-scale users such as agents and distributors, the Sprayon method is not intended to replace air-spray equipment for sizable operations. For example, it would not be profitable to resort to pressure-canned paint in the body and fender repair shop of an automotive dealer's establishment, which is usually provided with an air compressor and spray guns. Last year the corporation produced and sold 92,000 units per month.

The nation's farmers and stock raisers are also being aided by the pressure package. Bombs containing insecticides designed to rid livestock of pests such as screw worms and horn flies are being widely distributed throughout the country because they offer an easy method of application farmers prefer to the older smears and drenches.

New pressure-packed products for the American householder appear nearly every day. In the line of sprays, there's one for dust mops that enable them to absorb more dust and to brighten waxed floors in the cleaning process, while another causes such dust-catching surfaces as phonograph records actually to repel dust. Antitarnish sprays for silverware and foam-type upholstery cleaners are becoming well known to the housewife, who will soon be able to buy a spray that will rejuvenate the nap of fabrics. Still another stops small runs in nylon hosiery and helps make them snag and run resistant.

Back of these once amazing but now commonplace conveniences stands a rapidly growing industry based on the

TOUCH-UP AEROSOLS

Shown above is an exhibit of various lacquers and other finishes for going over scratched or otherwise marred places on washing machines, furniture, office equipment and similar articles that may be slightly damaged during shipment or handling.

BELT DRESSING

Dressing may be applied to a moving belt as shown at the left without endangering hands or fingers. A product of Graton & Knight, Worcester, Mass., it is put on where most slippage takes place, that is, at the smaller pulley. Spraying may be stopped the instant slippage is corrected, thereby preventing wastage of the compound.

knowledge and experience of many specialists in the fields of pressure packaging and production. The manufacture of the containers differs little from that of the familiar beer can with the concave bottom. Crown Can Company, one of the first to go into the business, has captured a large share of the market with its popular Spra-Tainer, a unit with seamless sides and top and with specially treated interior surfaces to resist the corrosive action of some products. Others have followed Crown, with the result that containers of many sizes and shapes are now available with linings to meet varied needs. Of recent introduction by American Can Company is a glass-lined container. Starting with a bottle, the organization made a paperboard and metal protector to fit around it. While this type is breakable if improperly treated, it will cause no damage when shattered because the outer shell prevents the glass particles from flying around.

Paradoxically, the appearance of low-pressure aerosol did not rule out the high-pressure package but, instead, created a demand for it. As pressure dispensers became well known in the home, business began to inquire about refillable containers of bigger capacity for certain applications. A case in point is the restaurant which uses large quantities of whipped cream. Today, if the establishment is modern, that dairy product comes packaged in sizable cans that are under much higher pressure than the home brand. This is also true of insecticides, which are being put up under higher and higher pressures to satisfy the need for a bomb to rid large halls, tents and similar enclosed areas of mosquitoes and other pests. Because these containers are expensive they are of the refillable type.

The question of valving pressure packages has so far been solved more or less by the trial-and-error method and depends to a great extent upon the form of the end product (aerosol, spray or foam) and upon the dispersoid. For example, it was found that an aerosol insecticide could not be effectively dispensed through a simple straight-line orifice because it produced a fine stream rather than a spreading mist. Most valves designed for the latter purpose now have a small cavity behind a pinhole opening to bring about a fast drop in pressure and thereby the desired atomization. Those for foam-type containers simply allow the trapped solution to escape with a certain degree of turbulence to cause fluffing.

Can and valve assemblies may be divided into two classifications: those that perform right side up and those that must be inverted to function, the type used depending upon the nature of the material dispensed. Obviously, whipped cream is fed from a container that is inverted, while paint is applied with the pressure package upright or nearly upright.

At the top of the cans that are turned upside down in service there is a valve arrangement into which the fluid flows directly. Operating the valve when it points "up" merely bleeds off the confined vapor pressure, rendering the package useless as a self-dispenser. The containers that normally function right side up have a tube which extends from the bottom to the valve inlet and through which the fluid must pass to reach atmosphere. Reversing its position will, as in the case of the other type, allow the propelling gas to escape and destroy its usefulness.

The proportion of propellant to dis-

FIRST-AID KIT

The modern way of treating minor burns, including sunburn, is to spray on a healing and protective lotion.

SPECIAL HANDLING

A duplex pressure package for dispensing Larvex was developed because the mothproofing reacts chemically with metal. It consists of a bottle inside a metal-and-paperboard container (left) that affords protection against flying glass should the bottle break. However, the outer case is porous enough to permit the propellant to escape rapidly. A dismantled package is shown at the right.

persoid follows no set rule, the idea being to use the smallest possible amount that will produce the desired effect. It should be noted that there is little or no variation in internal pressure at a given ambient temperature during the active life of the package. So long as there is some liquefied gas in the can, the pressure remains constant—the solution and the vapor above it being in equilibrium.

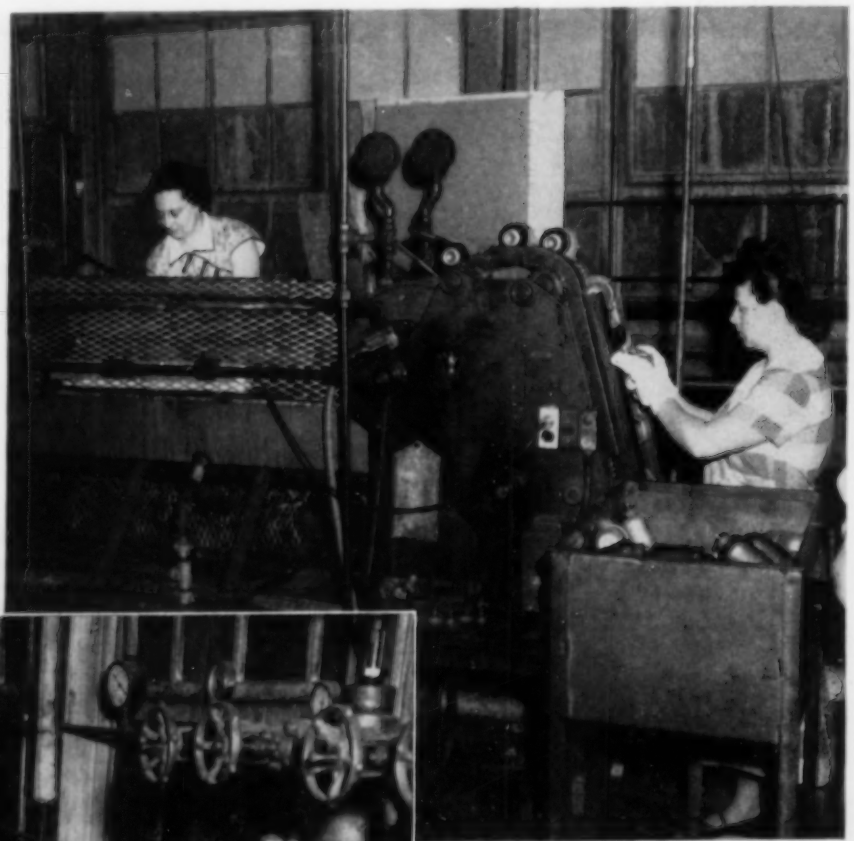
Selection of the carrier or propellant has been largely limited to Freon* or other gases of like properties. Freon-12 served extensively in early bug bombs because its vapor pressure of 70 psi at 70°F best met the needs of those packages. With the advent of the low-pressure container, combinations of Freon-11 and Freon-12 have been used—the former acting as a pressure depressant and sometimes as a vehicle for the substance to be dispensed. The proportion of the mix depends upon the required pressure and the dispersoid's depressant quality. In some cases that is so pronounced that Freon-12 alone may be used and still produce an internal pressure of less than 40 psi. In the foods industry, combinations of nitrous oxide and CO_2 are preferred because they are tasteless, odorless and nontoxic.

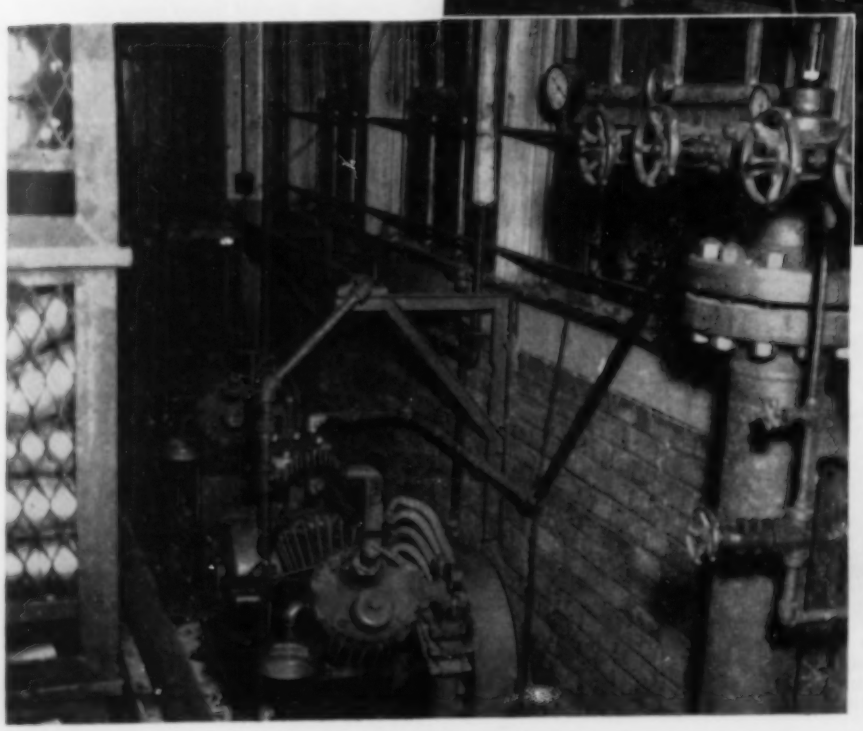
The packaging production line depends to a great extent on keeping everything involved—the propellant, dispersoid and cans, as well as the filling and capping machinery and supply-line piping—under proper refrigeration. This is usually accomplished with the aid of heavy-duty ammonia compressors which chill the solutions and equipment to below the boiling point of the propellant. The liquid carrier and the dispersoid may be mixed either before or after they are put in the containers. If done in advance there is always the risk of losing a large amount of the propellant through premature vaporization.

The generally accepted method is to place the material to be dispensed into the cans and to add the liquefied carrier just before capping. With the latter operation completed, the containers move along a conveyor system to a water bath that is maintained at 130°F. There they remain until the contents have been heated through to the same temperature. This is one of the Interstate Commerce Commission's safety regulations concerning the packaging of pressure cans. Any showing signs of leakage or distortion caused by the increased pressure resulting from the rise in temperature are scrapped.

Well-established as the business is, greater things have been predicted for the pressure package. Some of the overly optimistic have suggested that nearly everything liquid or that can be liquefied will eventually be dispensed in this manner. Others believe that the whole thing is a fad. Be that as it may, the future prospects of the industry probably lie somewhere between these two extremes, for the convenient dispenser has been received with so much favor by the public that danger of it being dropped is remote. It has become just one more of the thousands of little things that make up our way of life.

*Freon is a trade name for a family of fluorinated hydrocarbons produced by E. I. Du Pont de Nemours & Company. For example, Freon-12 is dichlorodifluoromethane. Freon gases previously gained recognition in the refrigeration field, particularly as a coolant in refrigerators and deep freezers.





TESTING CANS

At the plant of the Bridgeport (Conn.) Brass Company, refillable cans for high-pressure insecticide aerosols are tested for leakage as shown here. In this specially designed department the containers are first automatically charged with compressed air at 400 psi pressure and then immersed in water (above). The woman at the left is watching them for tell-tale bubbles. Her companion is clamping cans on a moving belt, after which they are pressurized and carried into a wire enclosure that protects workers in case of an explosion. Compressed air for testing is supplied by three Ingersoll-Rand Type 30 compressors that discharge at 450 psi pressure. Two are pictured at the left.

This and That

Panama Canal Overhaul

The first major job of reconditioning the operating mechanism of the Panama Canal since it was opened on August 15, 1914, has been started. The six locks and accessory equipment of the 50-mile "Big Ditch" are powered by 398 electric motors ranging from 7½ to 70 hp. In moving a ship through a set of locks, approximately 26 million gallons of water is pumped in or out. The sequence of operations involved in effecting the passage is controlled from a tower, and all the controls are being replaced with new ones by Federal Electric Products Company, Newark, N.J. This is the first phase of a 10-year reconstruction program that is designed to make the canal fit to handle more ships.

★ ★ ★

Father of Ball Bearings

The man who first made ball bearings and then founded the world-wide SKF Ball Bearing Company died recently in Sweden at the age of 76. He was Dr. Sven Wingquist, who pioneered in the field of human relations as well as in the reduction of mechanical friction. In 1907, when he was 31, he formed the company with a capitalization of only $22,000. Its factories in different countries now turn out one-seventh of the world's ball and roller bearings. The Swedish plant alone employs 11,000 persons.

"Isn't it wonderful the things you can do with compressed air?"

In 1907, twelve years before the 8-hour day was legalized in Sweden, Wingquist shortened the work week from 57 to 54 hours. He insured his employees in the following year and in 1913 started giving them four days vacation every twelve months with pay. That was twenty years before a national law made vacations compulsory. It was mainly for his efforts along these lines that he was awarded a doctor's degree in 1921 by the Stevens Institute of Technology, Hoboken, N.J.

★ ★ ★

Cooling Aggregates in India

Cooling concrete entering into a dam is being tried out in India for the first time at the Vaitarna barrier that is to become part of an enlarged water-supply system for the City of Bombay. It is to be a gravity-type structure 1820 feet long, 269 feet in maximum height and containing 700,000 cubic yards of concrete. A pouring temperature of 60°F is specified regardless of atmospheric conditions, and to achieve this it is necessary to mix it at around 55°.

Both coarse and fine aggregates are prepared by crushing basalt from nearby quarries. They are stored in a 6-compartment stockpile and withdrawn as needed by a conveyor system running in an underground tunnel. This delivers the materials to six bins, from which they travel to the batching plant through an insulated chamber 330 feet long, 33 feet wide and 10 feet high. There the fine aggregates are cooled by air chilled by cold water and the coarse aggregates are cooled by the water itself. The temperature of the water is reduced to 36° at a rate of 1600 gpm. Of this, 1000 gpm serves to wash the air, which is then blown on the belt-borne fines at a rate of 27,000 cfm. The remaining 600 gpm is used to spray and inundate the coarse aggregates. Pouring started last year in May, which is the hottest month. With an average maximum outdoor temperature of 95°, concrete was regularly placed at 68°.

★ ★ ★

Rise of Six Brothers

Another success story, built on the familiar theme "It can happen only in America," concerns the meteoric rise of the six Pacella brothers of Dedham, Mass. When their father and mother arrived here from Italy in 1914 there were four sons—Querino, Michael, Arthur and John. Shortly the family became so large that Mike was sent to live with an uncle, a sewer contractor in Dorchester, Mass. When he was twelve he went to work for his uncle as a water boy, and a little later the three brothers joined him. In the years that followed they received a liberal education in the art of moving dirt and rock.

In 1946 the brothers bought five pieces of war-surplus equipment, including an Ingersoll-Rand 105-cfm portable air compressor, and obtained a contract for a $32,000 sewer job in Milton, Mass. This launched them in the construction business, and they have forged steadily ahead. One of their projects involved driving a mile-long tunnel 80 feet underneath Fall River, Mass., and they are now constructing a $10,000,000 housing development on their own account in Dedham. Today, two more brothers are in the firm, and some sons have also gone to work—at the bottom of the ladder. The five pieces of equipment have grown to more than 60, including six I-R portable compressors.

"Why, yes, I did work in a supermarket at one time, Why?"

★ ★ ★

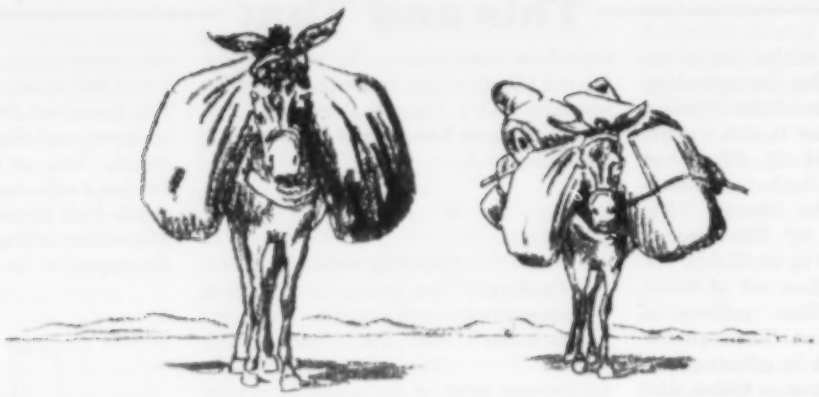
British Patent Office

This year the British Patent Office has been in existence for a century. The laws and procedures that now govern it evolved gradually from the old statute of monopolies that dates back to 1624. It was not until 100 years ago that provision was made for publishing specifications. As it now exists, the patent office is based on legislation enacted in 1883. By 1900 its archives had grown to include records on 375,000 inventions collected in 1168 volumes of 200,000 pages. It now takes 1000 persons to keep abreast in processing the flood of applications.

★ ★ ★

Facts About Hair

The Toni (hair-wave) laboratory in Chicago has come up with some little-known facts concerning human hair. Hair, we are informed, has a breaking strength of 6000 to 7000 psi—about half that of iron. Dry hair will stretch 20 percent without breaking; wet hair even more. Young people grow hair fastest, but half an inch per month is a good average for all ages.



Beans and Burros

Oldtime Prospector Relives a Few Days of 1906 on the Western Desert

A. A. Richie

IN FEBRUARY, 1905, I arrived at Rhyolite, Nev., from Wyoming, where I had grown up and had done a considerable amount of burro punching in Albany and Carbon counties. By the time I was fifteen years old I had become quite proficient at throwing pack hitches and also at flipping flapjacks.

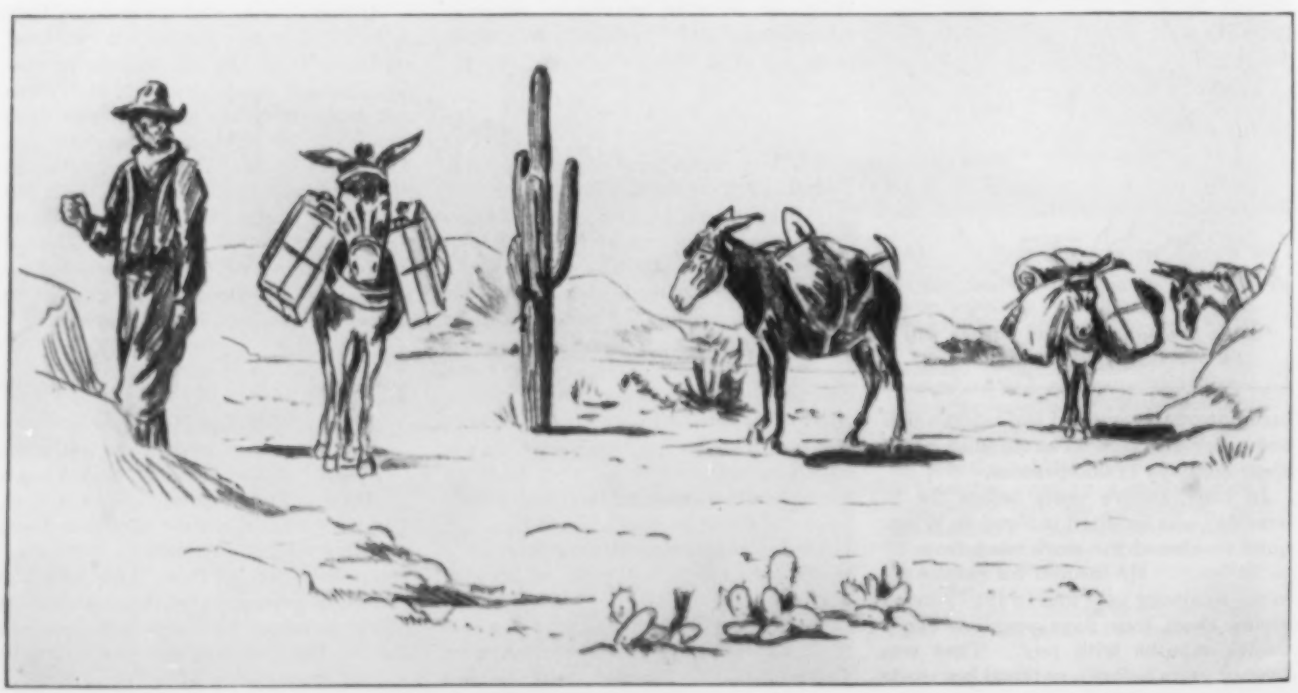
When I reached Rhyolite, I don't believe there were more than a dozen tents standing, and no houses at all. By July it was a real tent city of 5000 people, so it was said. It took me only a few days to find a job, as I was fairly well known among the miners as a prize hand driller. In April, I was working in a hole in the ground (I surely won't call it a mine), when my friend "Big Herman" Moll came along with five jackasses and a frying pan and a tent.

Herman and the jackasses domiciled themselves at a spring about 2 miles west of Rhyolite where there was good picking for the animals. Herman told me he had found a few small pieces of brown iron rock that showed gold when panned and that he was going back and dig around the spot for a few days and asked me if I would like to go along. The boom was on, and I was sure that any kind of a showing of mineral would be salable. I wanted to get out of the hole in the ground for a few days anyway, so I accepted his invitation.

Herman said there was no wood or water near the place where he had discovered the ore, and that we would have to pack water in and dig greasewood to cook with. The first thing we did after I got a 10-day layoff from my job was to go to the grocery store and buy about 15 or 20 pounds of white navy beans, the preparation of which is the principal subject of this story.

We went out to the spring, where there was an abundance of sagebrush. Some of it was 4 or 5 feet high, and it was not unusual to dig out pieces 4 or 5 inches in diameter at ground level. We cut a 5-gallon gasoline can in two at the middle and put on a baling-wire loop and filled it about half full of beans. At that time all the mine hoists were run by gasoline engines and gasoline was obtainable only in those cans, which were piled up around every hole in the ground where there was a hoisting engine.

We had driven two sticks into the ground and fastened another one on top of them on which to hang the kettle or half of the gasoline can. We put about a tablespoonful of salt in with the beans and water, nothing else. We cooked the beans until they were almost ready to break, then took them off the fire, poured the water into another can and spread



the beans out on a large clean tarpaulin to dry. When they were entirely dry on the outside, we put them in a flour sack and hung them on the tent pole where the donkeys couldn't reach them. Then we prepared another batch of beans for cooking and poured on the water from the first batch.

In this way we cooked up about half a flour sack of beans and then tore down our residence and loaded it and the beans and our other things on the burros and started for the place where Herman had found the float southeast of Stovepipe Wells in California. We had our tent, bedding, grub, two picks and a shovel on two of the jackasses. The three others were loaded with gasoline cans filled with water and about half a sack of barley.

We reached our destination early in the afternoon, and as we had been walking since morning with nothing to eat, the first thing we did after unpacking the burros was to fix some food. We ripped two gunny sacks into pieces about 4 feet square and took them out to gather fuel with which to cook our meal. The only wood around was a stunted greasewood bush about 6 inches high. It was a mass of thorns. I grubbed the greasewood out with a pick and Herman, wearing a pair of leather gloves, piled it on the gunny sacks.

We got a fire going, cooked some bacon, put a goodly amount of the partly cooked beans in a frying pan and poured on some bacon grease and a little water. We had quite a pile of greasewood, but the pieces were so small and so full of resin that it was all gone in a short while. But the beans had boiled, and with them and the bacon and a big piece of sour-dough bread we had baked at the spring out from Rhyolite, we had a dinner that I am sure I could enjoy thoroughly even today under the same circumstances. We kept the beans hanging on the tent pole and used them as we needed them. I suppose the moisture in them would have caused them to mold in another climate, but there on the edge of Death Valley the last of the lot was just as good as the first.

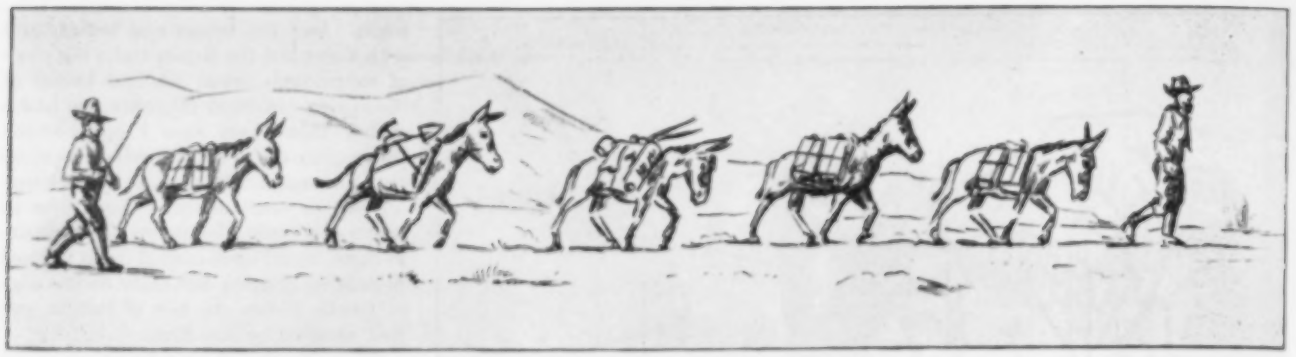
We had a jar of sour dough along for making bread, but we had so little fuel and it was so hard to get that we made thick flapjacks after we had used up the loaf of bread we had brought along. We carried the jar of dough open on a burro, and while it was of about the consistency of hot-cake batter we never spilled a drop; in fact Herman packed some all summer without losing any of it.

To make a batch of flapjacks or dutch-oven biscuits we took half of the sour dough that was in the jar, put in about a tablespoonful of brown sugar, a teaspoonful of salt, some bacon fat for shortening and about three-fourths of a teaspoonful of soda. If there is any better way of preparing either of these foods I have not found it out. I have seen sour-dough cakes advertised in California restaurants.

I got the idea of carrying the sour dough from a couple of prospectors in Wyoming. The idea of cooking the beans and then drying them was Herman's. We had dried apricots along and ate some at almost every meal. Herman said they would keep us from getting scurvy while living mostly on beans and bacon.

We were on the trip seven days and had ten 5-gallon cans of water for our use and for the pack animals. We had a large wash basin along and used more water

Drawings by Andrew Svachak



to wash our hands and faces in the morning than we did when we were at the spring. We used no soap, and when we got through washing we gave the water to one of the burros. Each one got a basinful in the morning, and that was all for the day. When we got back to the spring at Rhyolite and turned the jackasses loose, I thought they would go to the spring right away and fill up on water. They did nothing of the kind, but browsed around for two hours eating the grass growing under the sagebrush before they went for a drink. The greasewood had new growth on it and was covered with thorns, but the burros ate it. One of them, named Ted, would go to a bunch, stamp on it a few times with his front feet and then eat it as though it had no thorns at all.

We dug until our picks were so dull they were like hammers, and the jarring was making our hands lame. We were about out of water when we decided that we couldn't find where the gold-bearing specimens came from, so we packed up and went back to the spring. When we got ready to move, we laid out a load for each burro and divided it into two piles. After the ten piles had been arranged, we led one of the animals between two of the piles. Herman was on one side and I on the other, and I am sure that less than a minute passed from the time we lifted the piles off the ground until we had them on the burro's back secured by a diamond hitch. I don't believe we were more than five minutes packing the donkeys and getting away. Herman took the lead and I got behind and gave the word to go, and we were off. We had no halters on any of the burros. If one of them fell behind a little, I would give it a prod and it would soon be out of my reach.

We got back to the spring early in the afternoon, put up the tent, baked another loaf of dutch-oven bread and had dinner. Then I bundled up my bedding, slung it on my back and that evening I was back in Rhyolite. The next morning I was back at work, a little more sunburned, a little wiser and perhaps a little happier from my experiences with Herman and his jackasses. I have never seen a greater display of beautiful wild flowers than was on the desert that spring.

It is now 48 years since I made the trip and I am still contemplating making just one more. I am hoping to go to Wyoming and get myself a couple of pack animals (I hope they will be burros), hit the North Platte River at about the Wyoming-Colorado line, try to fool a rainbow with a Queen of the Waters or a Royal Coachman fly and forget that I have swallowed a lot of Nevada and California dust.

I have not tied a diamond hitch on an animal in more than 30 years, but I run through the operation in my mind every now and then and am sure that if I do get to Wyoming this year with two other old birds about my age I can walk up to an animal and throw it on just as though I had done it yesterday.

EDITOR'S NOTE:

The author of the foregoing reminiscences is a veteran prospector and miner who now lives at Rialto, Calif. His belief that he could still throw a diamond hitch even though he had not attempted it for 30 years was evidently no idle boast. Since we received the article from him he has done it.

It came about in this way: There was a big celebration in Death Valley. One newspaper estimated that 34,000 persons attended it. Mr. Richie was invited, with all expenses paid, if he would demonstrate the diamond hitch. For the benefit of the uninitiated, Webster says that a diamond hitch, in tying a pack on an animal, is an interlacing of ropes forming a diamond on the top of the pack.

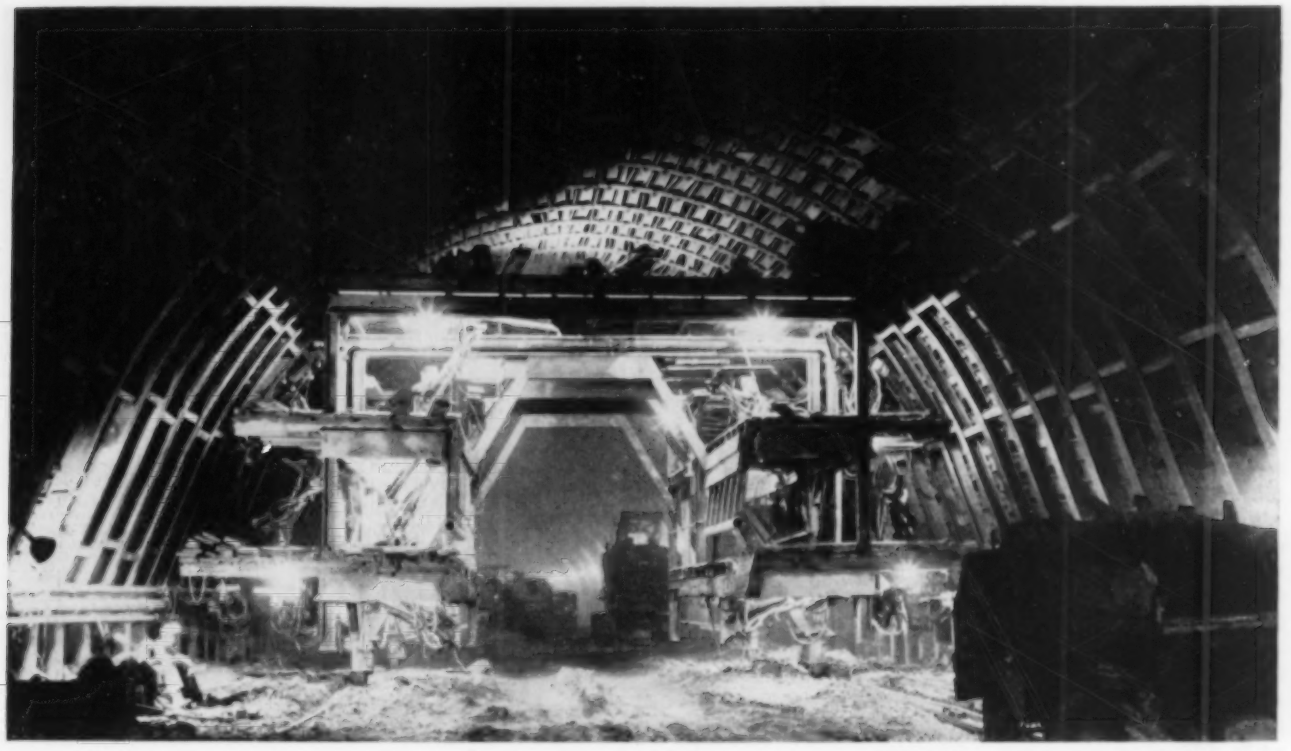
In Mr. Richie's own words, "I walked right up to that lady jackass and threw a diamond hitch on her just as though I had been doing it every day for the last 30 years."

Another attraction was a donkey race. Each contestant had to unpack his animal, make his bed on the ground, build a fire, fry a flapjack and give it to the burro. If the animal refused it, that was proof that the pancake was not cooked right and the contestant was disqualified.

New Box Car Unloaded with Aid of Air

A BOXCAR with built-in facilities to help in unloading granulated or powdered cargoes with air pressure is being offered shippers by General American Transportation Company. The interior of the car is divided into bins that have sloping sides lined with a porous fabric. Each is provided with an overhead loading hatch.

For unloading, the bins are tilted, in turn, and the finely divided bulk material such as stock feed or chemical in powdered form flows to an opening in the bottom. To keep it moving, air is introduced through the fabric lining. This fluidizes the cargo and prevents it from sticking to the sides. The air is supplied by a blower and distributed to the bins by built-in piping, manifolds and other devices.



SECTION OF TUNNEL

The vaulted opening, 51 feet 7 inches wide and 29 feet high, with steel-rib arches in place and supported on posts at side walls. The front end of the 17-drill, 3-deck carriage is shown moved back from the heading. Wings on the second deck are folded down to provide a passageway for trucks. Approximately 22 feet of rock still had to be taken up from the bottom to complete the full-circle cross section of the bore.

Tunnelers Make Record at Niagara Falls

H. R. Rice

WHILE working on two of five sections of 51-foot-7-inch-diameter twin tunnels being driven at Niagara Falls, Canada, for The Hydro-Electric Power Commission of Ontario, Rayner-Atlas Limited, a partnership of two large Canadian contractors, has established what is believed to be a record for advancing the top heading of a bore in this size range. In the six days ending January 9, crews on three shifts under Hugh MacIsaac, No. 2 Shaft superintendent, drove 469 feet, thus exceeding a mark of 420 feet set in December, 1952, by crews under Alex Judson, No. 1 Shaft superintendent. In both cases, two faces were advanced in opposite directions from one point of access.

The two 5½-mile parallel tunnels, which will be lined with concrete to a finished diameter of 45 feet, will divert Niagara River water from above the falls and carry it under the city to the 1,200,000-hp Sir Adam Beck Generating Station No. 2 at Queenston. They are generally 250 feet apart and reached by five vertical shafts spaced along the route and sunk midway between the two. The plan of construction adopted called for the top-heading-and-bench method, with No. 1 Tunnel to be driven first. Its top heading has been holed through and the bench is being excavated. Meanwhile, work on the top heading in No. 2 Tunnel has been started.

The tunnels are of circular section and reach a maximum depth of 330 feet. The top heading includes all that part of the circular cross section that lies above a horizontal line 3 feet below the center. It provides a drilling face having a maximum width of 51 feet 7 inches and a maximum height of 29 feet and involves the removal of 44 cubic yards per linear foot of advance. This is roughly two-thirds of the total for the full circle, leaving one-third to be excavated by benching.

The sedimentary strata penetrated dip on a very gentle slope toward the south, and by driving the bores on the same grade it has been possible to keep the arch under the Irondequoit limestone, which provides a strong roof. The upper 12 or so feet of the top heading is in Reynales dolomite which is underlain first by 6 feet of Neagha shale, and then by 8 feet of Thorold sandstone. The bottom 3 feet is in Grimsby sandstone, which extends well below the tunnel invert.

Drilling in each of the tunnel sections concerned is done with seventeen Ingersoll-Rand DA-35 drifters on a 3-deck carriage that is supported on four sets of tandem wheels (one set at each cor-

SUMMARY OF OPERATIONS, JANUARY 2-9, 1953

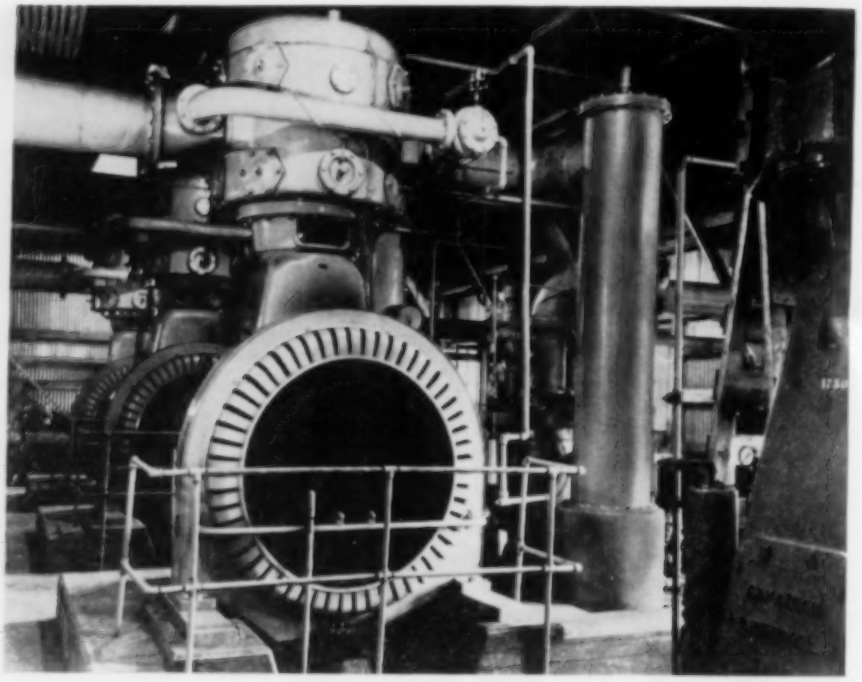
Number of rounds drilled and blasted	28
Average time per complete round	5 hrs 8 min
Advance per round	16.75 ft
Average daily advance	78.1 ft
Number of holes drilled per round	159
Average footage drilled per round	3,220
Total cubic yards excavated	20,636
Average powder (70 percent) used per cubic yard	2.27 lbs
Total number of steel ribs placed	117
Total tons steel placed, including lagging	331
Maximum number of ribs placed in 24 hrs	20
Total timber blocking placed	70,350 fbm

ner) and runs on 80-pound rails set in 15-inch channels. Each machine is mounted on a hydraulic jib or boom that can be elevated, moved from side to side or extended by manipulating three control valves, thus positioning the drill as desired without manual effort. Three of the jibs are on the top deck, four on the intermediate one and four on the bottom platform, with the six others inverted and suspended from the underside of the bottom deck. Each carriage is self-contained, has two air-driven pumps for operating the booms, and manifolds for distributing compressed air and water.

Each drifter is moved back and forth on its 48-inch shell by power feed. The actual drilling element consists of a Carset (tungsten-carbide insert) detachable bit on 1⅛-inch round lugged drill steel. A drilling crew is composed of 37 men—seventeen drillers, seventeen helpers and three "pushers"—and works alternately in the two headings opened from each shaft.

At the rear of each carriage is a section for carrying steel ribs, steel lagging and wood blocking with which to erect supports where the rock requires it while drilling is in progress. The ribs are made up of four pieces of 8-inch H-sections that are butt bolted to form a continuous member extending around the top half of the circular cross section. The ends of each rib rest on wall plates, consisting of two 10-inch I sections, and the wall plates, in turn, rest on 12x12-inch timber posts about 5 feet long.

Broken rock is loaded by 2½-cubic-yard diesel shovels with shortened booms and dipper sticks into 14-yard diesel trucks that haul it to a skip loading pocket at the shaft bottom, where it is dumped onto a grizzly. A bulldozer and a tractor-mounted overhead loader assist in cleaning up the floor. Average mucking time is about four hours.



SOURCE OF AIR SUPPLY

At each of the two shafts from which Rayner-Atlas is advancing tunnels compressed air is supplied by three Canadian Ingersoll-Rand compressors with an aggregate capacity of approximately 4500 cfm and driven by synchronous motors. The machines located at one shaft are shown here.

The hoisting distance is 400 feet at No. 1 Shaft and 360 feet at No. 2 Shaft. Each is served by two 10-yard top-dumping skips which are run in counterbalance by a 72x42-inch double-drum hoist powered by a 500-hp motor and geared to give a top rope speed of 400 feet per minute. The service cage, which is also counterweighted, is operated by a 60x48-inch double-drum, single-reduction hoist.

For tunneling, approximately 4500 cfm of air is furnished at each shaft by two Type XVHE compressors direct-driven by synchronous motors and one XVHB unit belt-driven by an induction motor. Air-delivery mains are 6 inches in diameter.

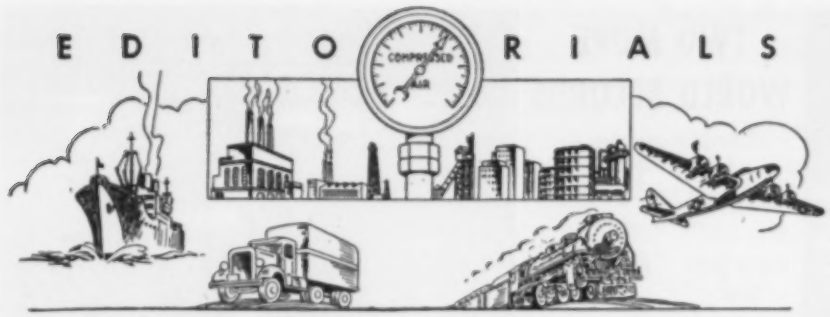
Ventilating air for each heading is supplied by a 300-hp reversible fan rated at 75,000 cfm at 1200 rpm. It is conveyed down the shaft in a fabricated steel duct and from there to the face in 60-inch wooden ducts suspended from the top center section of the steel ribs. After a blast, the fan is reversed long enough to withdraw smoke and fumes.

Advancing the top heading 469 feet in six days required the drilling of 90,160 linear feet of blast holes, or an average of 300 feet of hole per drill per shift. Other salient facts concerning the week's performance are contained in the accompanying summary.

DIRECTORS OF RECORD PERFORMANCE

Members of the contractor's staff and representatives of The Hydro-Electric Power Commission of Ontario (HEPC) concerned with the 469-foot advance in six days at No. 2 Shaft. From the left, they are: Walter F. Dechman, HEPC divisional engineer; J.M. Seubert, engineer No. 2 Shaft; W.F. Chisholm, control engineer; R. McMaster, night superintendent No. 2 Shaft; Carl Larsen, general superintendent; Dave Scott, shift foreman No. 2 Shaft; L.W. Mackenzie, HEPC assistant divisional engineer; W. Lundmark, captain No. 2 Shaft; H.M. Scott, managing director; H. McDonnell, mine captain No. 2 Shaft; T.A. Lazier, chief engineer; R. Hawley, timber captain No. 2 Shaft; and Hugh MacIsaac, superintendent No. 2 Shaft.

EDITOR'S NOTE: General features of the project touched upon here and details of the operations involved will be presented later.



RHODES CENTENARY

BEGINNING the first of this month and continuing until the end of August, central Africa is observing the centenary of the birth of Cecil Rhodes. Sponsored by the governments of Northern and Southern Rhodesia, which countries were named for the great empire builder, the observance will take the form of an exhibition designed to show the industrial and social status of the region that few white men bothered about until Rhodes revealed its natural wealth.

Most of the countries in Africa and the United Kingdom will participate. Preparations for the care of the 750,000 visitors that are expected during the summer included the construction of 2500 houses at the rate of 100 a day, a 3000-seat theater and other structures. Queen Elizabeth and Princess Margaret of England head the list of notables scheduled to attend.

The affair is important in itself and also of interest because it focuses attention on Rhodes, a remarkable man of whom the present generation has heard little. No nation ever had a more zealous unappointed ambassador than Great Britain had in Rhodes. A great fire of patriotism burned in his breast, and he sought with all his might and main to bring English influence and rule to all Africa, "from Cairo to Cape Town." He fell short of attaining that goal, but he did succeed in giving the British an important foothold on the Dark Continent and in leaving his own mark indelibly on some parts of it.

The course of history is often swayed by minor matters, and so it was in this case. Rhodes might never have seen Africa had not his health been poor as a youth. Born on July 5, 1853, he was the fifth son in the large family of a clergyman in Hertfordshire, England. He grew up with weak lungs, and because of this was sent when sixteen years old to join his brother Herbert, a farmer in Natal. In that year—1869—diamonds were discovered at Kimberley, and the brothers got in on the ground floor. In less than three years they were financially independent and the dry air of Africa had restored Cecil's health.

Thus relieved of the necessity of working, he turned his attention to studying the natural potentialities of the continent he had adopted. One of his first moves was to travel for eight months by ox team through the vast virtually unsettled expanse north of the Orange and Vaal rivers, including the Transvaal. He recognized that it could be developed into a rich agricultural area and also saw evidence of mineral wealth. It was then that he dreamed of bringing it all under British domination, and in a will written when he was 22 he gave his reasons and bequeathed all he owned to the furtherance of that purpose.

Deciding that he should educate himself for the work ahead, he returned to England and entered Oxford University, but his health failed and he went back to Africa after a few months. Unknown to him the doctors had given him only six months to live, but almost magically the country restored his health once more. From 1876 to 1878 he resumed his studies at Oxford. Even while in school his investments in Africa were growing spectacularly, and he spent all his vacations there looking after them. After his return he showed his flair for financial leadership when he consolidated the larger diamond mines at Kimberley with the De Beers Company.

When gold mining on the Witwatersrand was in its infancy, Fred W. Alexander, a merchant of Kimberley, was passing through the area. He carried back some samples of the reef banket or conglomerate and put them on display in his store. He invited some of the diamond men to look at them, and Rhodes was among those who responded. Impressed, he went to Johannesburg and acquired some interests. He was more optimistic over the future of the industry than were some of the other early investors and paid one farmer nearly $200,000 in cash and $150,000 in stock for his land.

Soon afterwards, Rhodes proposed an amalgamation of several large mining interests along the lines of the diamond-company merger he had engineered. One meeting was held. When it seemed that the plan might be carried out, Rhodes dropped everything upon receiving word of the illness of his close friend Neville Pickering, secretary to De Beers, and went back to Kimberley. He remained there until Pickering died, and by the time he returned to Johannesburg it was too late to put through his scheme. Some historians say that Rhodes, had he chosen to put business before friendship, probably would have come into control of most of the Rand mines. His decision to go to Pickering was, he said, "a sacrifice he never regretted." Later he combined some mining interests on a smaller scale than was originally visualized into Consolidated Goldfields of South Africa. Even that venture was enormously successful, and in some years his income from that source amounted to from $1,500,000 to $2,000,000.

In 1890, Rhodes became prime minister of the Cape Colony and wielded great power during his six years in office. Although he was continually striving to put Britain in control of Africa he made a place for the Dutch in his plan and sought to unite the Dutch and British viewpoints. That was not to be, however, and war inevitably came between them. We are not concerned here with the rights or wrongs of that conflict but only with an appraisal of Rhodes as a man with an overwhelming purpose. He had a deep-rooted love for Africa, and that extended to the natives. He gave them employment in the mines and insisted that they be treated well. He was, in effect, a benevolent despot. In return, the natives trusted him, as a story makes plain.

During the Matabele Rebellion in Rhodesia in 1896, British troops drove the natives into a virtually impregnable mountain stronghold. A long siege seemed to be inevitable, but Rhodes decided he could do more than the soldiers to bring about peace. Detaching himself from the troops and ordering them to remain behind, he moved his tent to the base of the hills and lived there unconcernedly with no protection other than three friends. After six weeks the natives, realizing he was undefended, called a council and invited him to attend. He and his friends rode to the meeting place and obtained a pledge of peace, which also included some concessions the British wanted.

When the Boer War broke out, Rhodes was busy in Rhodesia building railroads, telegraph lines and other connecting links that fit into his scheme for a united Africa. He also had started developing some of its mineral resources. He died in March, 1902, at Cape Town before hostilities ended.

Seeking to make his money go on working in the interest of England after his death, he bequeathed his fortune to setting up the well-known Rhodes scholarships to Oxford University that have helped educate hundreds of youths. Candidates are eligible from all British colonies and one from every state in the United States. In a codicil to his will he even provided for a few students from Germany. All in all, Rhodes is assured a place in history as one of the builders of the British Empire.

PERSONNEL AND DRILL CARRIAGE

More than 100 men working around the clock in three shifts advanced the 25-foot heading 282 feet in six days—an average of 47 feet per day. However, those who planned and directed the efforts were as happy over the accomplishment as the "tunnel stiffs" themselves. Here are some of the top men of Morrison-Knudsen of Canada shown in front of the drill carriage. From the left: A.O. Strandberg, project manager; G.A. Griffin, vice-president; V. Bland, job superintendent; Cy McLellan, assistant job superintendent; George Price, swing-shift walker; R.E. Davis, general underground superintendent; H. Lange, swing-shift superintendent; J.B. Bonny, president of the parent United States Company; R.E. Reed, area engineer; and R.H. Madsen, area manager.

Alcan Tunnelers Better Record Again

SNOWED in 400 miles north of Vancouver, B.C., 3400 persons, including 450 women and children, spent the winter at Camp No. 5 of Morrison-Knudsen Company of Canada, Limited. The winter weather was severe, but it mattered little to the workers on the Alcan Project (described in our August, September and October, 1952, issues) because most of them weren't going anywhere except inside the mountain.

Some of the men were hollowing out a huge cavern there for a 1,200,000 hydroelectric power plant; others were driving underground inclines up the steep slope for penstocks; and still others, farther up, were pushing a 10-mile, 25-foot-diameter tunnel through solid rock so that water may someday rush through from the other side of the mountains to turn turbogenerators that will feed electricity to the melting pots of the Kitimat aluminum smelter 50 miles to the north.

With its relatively large population and such conveniences as a library, movies and clubs for drama, bridge and badminton addicts, Camp No. 5 is a metropolis compared with some outlying smaller camps housing tunnel drivers working at two headings reached through the central Horetzky adit and those at the heading at the opposite end of the bore. Being really marooned and with nothing to distract their attention, the lads at Horetzky concentrated so much on the work at hand that they set a new progress record for a 6-day week.

The latest mark of 282 feet was made by the west-heading crews from February 15 to 21, and it was the fifth time since last September that Alcan hard-rock men have bettered the 241-foot weekly progress figure for a tunnel in this size range established at Big Creek No. 4 Dam in California in December, 1949. The four previous record Alcan performances were 248 feet in September, 258 feet in October and 261 and 274 feet in November. The first three of these marks were set at the Kemano (discharge) heading, and the one of 274 feet that was recently eclipsed was made by the east-heading crews at Horetzky. For good measure, the new titleholders also effaced the best previous daily advance of 55 feet by driving 61 feet in 24 hours.

The equipment used in this latest M-K feat was the same as that in the four earlier efforts. It consisted of fifteen Ingersoll-Rand power-feed DA-35 drifters on a conventional platform-type carriage and equipped with 4-point Carset (tungsten-carbide-insert) detachable bits. A round consisted of 96 holes, and the average drilling time was 95 minutes. During the week a total of 30,520 feet of blast holes was drilled and 6627 cubic yards of rock, in the solid, was removed.

With a lot of rock still to be excavated, and rivalry among the various crews at fever pitch, the current record may be only a transient one.

Wife of Leading Constructor Honored by Coast College

Mrs. Ann D. Morrison was acclaimed "first lady of construction" when awarded a doctor of laws degree at Pepperdine College, Los Angeles, Calif., on May 8. The event ushered in an annual program designed to pay homage to the "Builders of America." Mrs. Morrison has accompanied her husband, H. W. Morrison of Morrison-Knudsen Company, Inc., to the far corners of the earth to visit construction jobs, and her diary was recently printed in book form.

Pneumatic System Solves Dough-Dusting Problem

BREAD bakers have long been plagued with a problem that creates insanitary conditions in their make-up departments where dough in transit is dusted with flour to prevent it from sticking. This is customarily done by mechanical means with flour, which not only settles on everything but offers breeding grounds for insects. Now, we are told, there is no longer any excuse for untidiness and insect infestation because of a new dusting system developed by H. Cole, president of Craig Corporation. Instead of flour he used starch, which does not nurture insects and which is applied by pneumatic equipment.

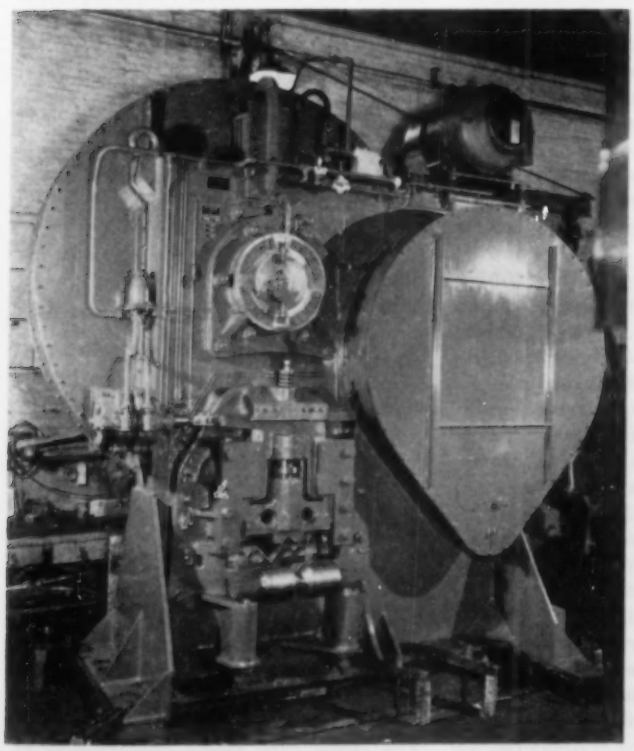
The first unit was installed in the plant of the Gottfried Baking Company in New York City where it is serving to dust five different kinds of dough for bread and rolls as they pass through a divider, rounder, overhead proofer and molder. It consists essentially of a dispersion chamber into which starch is fed at timed intervals from a stainless-steel bin with a capacity of 65 pounds. Oil- and moisture-free air at 25 psi pressure is introduced into the chamber and carries the material to the different points of use, where the pressure is variously reduced to 1-2 and 5 psi. One or two jets, each mounted in a hood, apply the starch in the form of a fine cloud, any excess being prevented from escaping into the room by a 16-inch suction fan which draws it through 4-inch ducts into a dust collector, where the starch is filtered for recirculation.

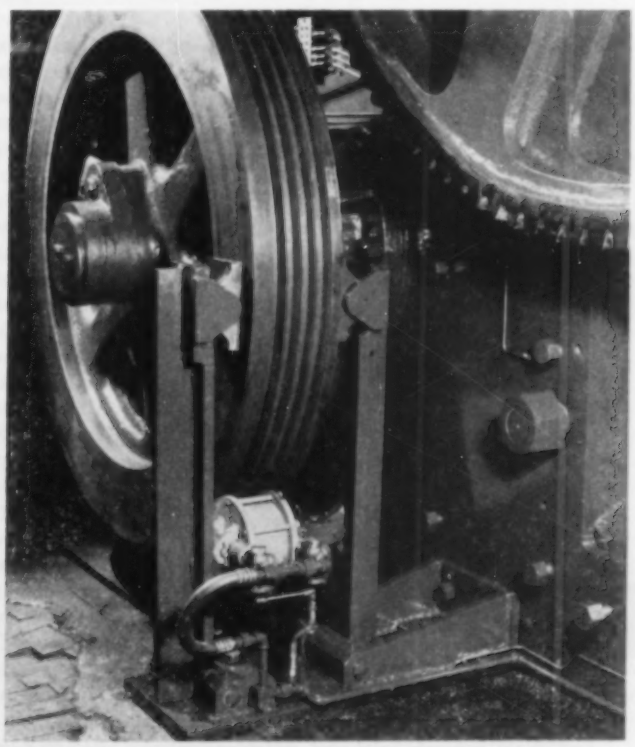
According to the manager of the bakery, the pneumatic system has many advantages over the seven mechanical dusting boxes that were formerly required to do the work. Take the matter of cleanliness, for example: Today, approximately 3 pounds of starch pile up at each end of the dough proofer in 24 hours, as against 200 pounds of flour by the old method. Furthermore, only 6-odd pounds build up inside the unit in seven days so that it can be cleaned once in six weeks instead of weekly when several hundred pounds had to be removed.

In addition, the dough is always well coated even though the pneumatic system uses far less dusting material. Where 36 bags of flour were previously required each week, eight bags of starch now suffice—a saving of 1456 bags a year. And then there was the matter of respiratory illnesses attributable to the dusty conditions to which the men in the make-up department were continually exposed.

Heavy-duty Billet Shear Features Pneumatic Cylinders

AIR cylinders perform important functions in the operation of a series of improved heavy-duty billet shears built by the Buffalo Forge Company for automobile factories and large forge shops. The machines range in capacity from 325 to 2200 tons, and the newest of them are equipped with four air cylinders. The clutches that grip the nicked billets are of the 3-jaw type. They are engaged and disengaged by a rotating-type pneumatic cylinder, while the hold-down, which clamps the billet in unison with the movement of the cutting knife, is actuated by means of a horizontal cylinder cushioned at both ends. The knife itself is attached to a plunger counterbalanced at the top of the shear frame by a pivoted cylinder. These units, in the order in which they are mentioned, use air at 30, 100 and 70 psi. The controls of all three are timed by the action of cams which cause pilot valves to operate 4-way valves. Each is complete with reducing valve, air strainer, lubricator and water trap. The latest large-size shears feature a flywheel with an air brake. Before the installation of this device the gears and flywheel revolved at coasting speed for approximately twenty minutes after the main drive motor was shut off. Now a unit can be stopped within fourteen seconds.

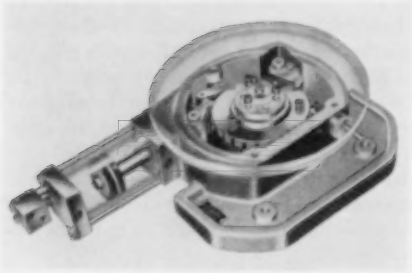




BILLET SHEAR AND FLYWHEEL

Of the three air cylinders that play a vital part in the machine's operating cycle only a section of one is visible at the top of the shear frame. A large unit, it serves to counterbalance the plunger to which the billet knife is attached. Details of the flywheel and air-brake mechanism are shown at the right.

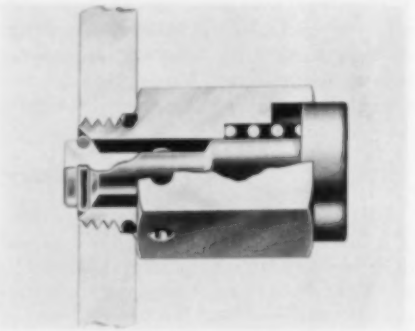
Industrial Notes



Two dial feed tables with an exclusive "positive lock" that is said to prevent the top plate from overriding and losing index under the most severe service conditions have been announced by A. K. Allen Company. This is achieved by a built-in auxiliary air cylinder whose sole function is to bring into toggling position a set of mechanical members which locks the feed pawl to the ratchet while a newly designed anti-backup pawl locks the table against rearward rotary motion. Indexing accuracy, measured at the periphery of the 11-inch plate, is guaranteed to be 0.002 plus or minus. Both models are available with the standard 4-6-8-12 and 24 indexing points and differ only in that one is equipped with a 2-way valve and pilot-timer valve for fully automatic operation. For work that requires extra-smooth functioning, the company offers a hydraulic check that absorbs the shock at the end of each index stroke.

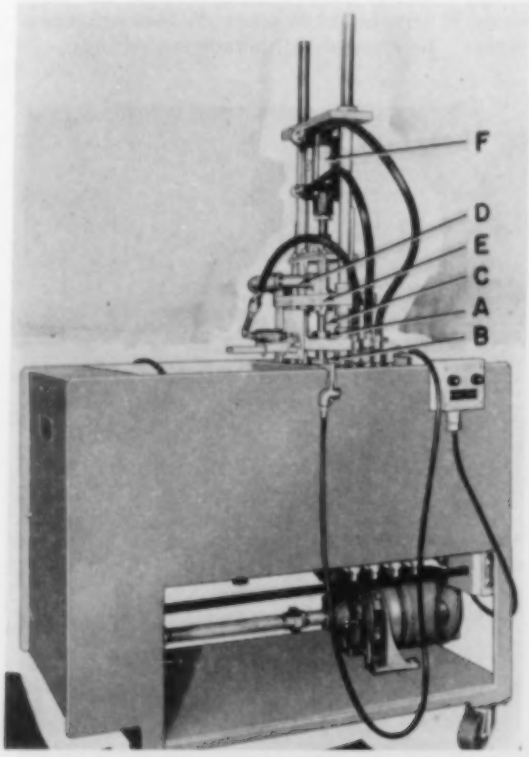
Glass cloth and a vinyl-plastic compound are being fashioned by Standard Safety Equipment Company into a fire blanket that seems to have many virtues. The coating is said to be resistant to acids, alkalies and most solvents; to be unaffected by the elements; to remain flexible at temperatures below zero Fahrenheit; and to provide a surface that does not support combustion and that can be sprayed with water or wiped with a damp cloth to keep it clean. In short, the blanket can be hung indoors or outdoors without a protective covering ready to be thrown over a person or machinery endangered by fire so as to smother the flames. Measuring 76x60 inches, it weighs only 2½ pounds. It can also be used as a welding screen and for other purposes.

For services generally performed by petcock valves, James-Pond-Clark has designed a manually operated release valve with an ingenious O-ring seal that is said to insure absolute tightness and to permit the rapid bleeding of air from pressure or fluid system, etc. Designated as Series 228, the valve has only four working parts and is normally held closed



by a spring when manual pressure is released. It may be installed with either a gasket or an O-ring seal. The standard unit has an over-all length of less than one inch and is manufactured of anodized aluminum which is resistant to oxygen and most corrosive atmospheres.

Human error in case-hardening drawing dies is eliminated, it is reported, through the development by The Palmer Manufacturing Company of the I. D. Hole Quencher, a machine that automatically performs the entire operating cycle when a push button is pressed. Before beginning a quenching run, the unit is adjusted for a die blank and hole of given sizes and the timing, temperature and other electrical controls in an enclosed panel box are set to insure uniform processing. Then the heated blank is placed on a base plate between two steel guides mounted on a coolant tank; two pneumatic rams, one above and the other below the plate, bring an outlet and an inlet adapter in tight contact with the die; and a centrifugal pump mounted underneath the tank forces brine or other solution through the die hole. When quenching is completed, an air-operated kickout ram pushes the blank into a tank for normal over-all cooling. The ejector is equipped with a throttle screw which is adjusted according to the weight of the part to be moved, and the air for the vertical rams, ranging in pressure from 30 to 50 psi, is controlled by a regulator valve. The equipment can quench holes from 1/16 to 3 inches in diameter in blanks from 1/16 to 6 inches long and ¼ to 8 inches in diameter. In addition to standardizing case-hardening, the machine does the work on a production basis.



OPERATES AUTOMATICALLY

The machine shows die "A" aligned on the base plate between inlet and outlet coolant adapters "B" and "C." The quenching solution flows back into the tank through outlet "D" which, together with plate "E," is adjustable. The upper adapter is brought in contact with the die by air cylinder "F."

Electrapane, a Libbey-Owens-Ford Glass Company product that has been made only for military aircraft, will soon be available for general use. It is a sheet of glass with a transparent metal film that carries electric current to keep windshields free of fog and frost.

For hazardous work such as cleaning oil tanks there has been devised a mask with a self-contained telephone that permits 2-way communication. It is connected by a neoprene-covered cable with a conventional hand-held instrument and enables the man inside the tank to ask for more air or help in case of trouble or danger. The device is named Maskfone and is made by Mine Safety Appliances Company.

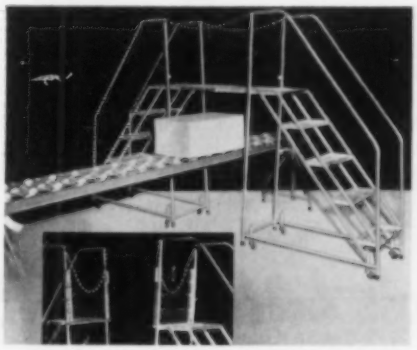
Disposable plastic liners for steel and fiber drums and boxes are serving a very useful purpose, according to shippers of liquids, semiliquids and bulk commodities. They are made of chemically inert polyethylene to hold most anything, even strong acids, alkalies and alcohol. The latest type has a circular disk at the bottom to fit without lapping, and a flexible hose placed between the lining and the container at the time of filling exhausts any air that might otherwise

form pockets. In the case of flat liners for boxes it is necessary to insert them with a mandrel. Drums so protected reduce wastage and are easy to keep clean because contents cannot stick to them, and with steel ones there is less chance of corrosion. It is further claimed that the plastic lining makes it possible to use containers of lighter weight with certain products.

A wider application of iron-powder metal is promised as the result of a new type that is said to possess several times the ductility of previous products. Where parts made from the latter withstand a pressure of about 35,000 psi, those of Steel Oilite, a development of the Amplex Division of Chrysler Corporation, can be subjected to 70,000 psi. With physical properties comparable to mild carbon steel, it is suitable for the production of gears, cams, brackets, lever arms and other machine parts that are beyond the range of ordinary iron powder. Though somewhat porous, it is not intended for self-lubricating service.

To meet the demands for a light generator that would make it possible to check sizable parts or a large number of small ones for surface flatness, finish, dimensions, etc., with ease and rapidity, The DoAll Company has developed an instrument that is claimed to be the largest thing of its kind available. Named Monolight, it is 20 inches in diameter and is mounted above a 30x30-inch worktable in a head that can be swung from side to side through a 160° arc, thus permitting additional pieces placed on tables alongside to be blanketed with light. The clearance between head and table is 24 inches so that parts of considerable thickness can be inspected. The intensity of the light, measured on the working surface, is 20 foot-candles, and excellent diffusion is obtained by means of a newly developed ceramic diffuser. Mercury vapor is the light-generating element and provides better fringe-line definition and less glare than do commonly used light sources. The large gauging area is particularly advantageous in checking quartz, germanium and other crystals for electronic applications. These crystals have a high coefficient of thermal expansion and are affected by heat from the hands. With the new monochromatic light, a large number can be set on the table and each can be covered with an individual optical flat and allowed to normalize. Inspection can then be made without touching the work.

Many steps may be saved where long floor conveyor systems block passageways by bridging them with ladders especially designed for the purpose by the Ballymore Company. As the accompanying illustration shows, they are made in two parts each of which is provided with safety rails and a hinged walkway that can be folded up so the section can be used separately. Known as Walk Overs, the ladders are built of steel and are available in two types of varying heights: one with rubber-tipped legs for permanent or semipermanent installation and the other with casters as well as rubber-tipped legs. When a person steps on the ladder, the casters retract, bringing the nonskid legs in contact with the floor.



Flashlight bulbs that throw either a flood or a spot light at the flip of a switch have been developed by General Electric's Lamp Division. Like automobile headlamps, they contain two filaments: one, in the form of a single loop, produces a broad beam for nearby seeing, and the other, a concentrated coil, provides a narrow ray for viewing objects at a distance. Special 2-cell flashlights to hold the lamps are now being designed by manufacturers in that field.

Labeling shelves, bins and drawers for tools, dies, parts, inventory and raw stock presents no problem, we are told, with a plastic tape that sticks permanently without moistening to any smooth, dry and reasonably clean surface. It can be marked, says the manufacturer, with any sharp pencil or instrument, pressure on the point causing the writing to appear clearly beneath the protective plastic, which keeps it clean and legible. Called Labelon, the tape comes in rolls of varying widths and lengths to fit dispensers and with bands of different colors for purposes of coding. Standard color combinations are blue, red, green, or black on white. It is made by Labelon Tape Company, Inc., 450 Atlantic Avenue, Rochester 9, N. Y.

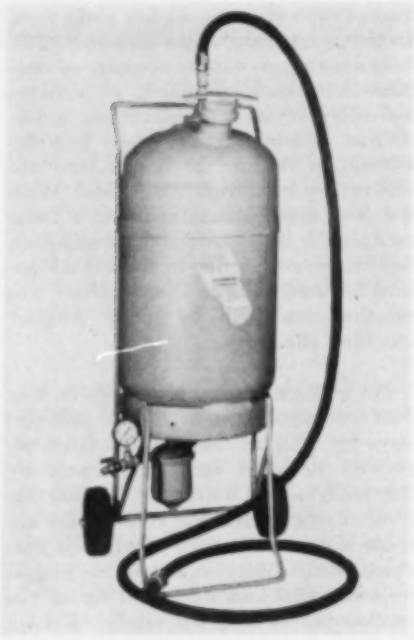
Rubber & Plastics Compound, Inc., is starting production on a heavy-duty nonreinforced flashing material that is an improvement upon its Nos. 30 and 60 Nervastral Seal-Pruf. Designated as Type H-D, it is said to be unaffected by acids, alkalies and wet and dry rot; not to bleed or stain; to remain flexible at temperatures minus 20 to plus 200°F; and to have exceptional tear resistance as well as bursting and mechanical strength. It comes in rolls 72 feet long and from 12 to 36 inches wide. Special odd sizes and narrow widths for wrapping pipe are obtainable. Sheet material may be applied dry by spot bonding.

What is claimed to be the world's largest scrap-handling system has been installed in Grand Rapids Plant No. 1, Fisher Body Division, General Motors Corporation. The main conveyor is nearly 1145 feet long and 4½ feet wide and is powered by two 10-hp motors at speeds up to 45 feet per minute. Converging on it at right angles are twenty 24-inch collector belts ranging in length from 61½ to 165 feet. The latter travel beneath rows of presses and receive loose metal scrap from them by way of chutes. The entire system, including balers and a baled-scrap conveyor, is operated by one man from a single control station and handles 500,000 pounds daily.

At its Pueblo, Colo., coke plant, The Colorado Fuel & Iron Corporation has, it is claimed, raised its coke production by 16 percent through the installation of a new washery. Slack coal entering the latter is classified according to coking characteristics, ash, and other properties and dumped into one of five bins. From

there it is dropped through a bottom gate and mixed in proper proportions before going to the washing jig. There it passes over a screen where water removes rock, slate and waste material. Before the clean fuel is stored in the blast-furnace charging bins it is run over a dewatering screen and through centrifugal driers. Fine coal carried away by the water is recovered in settling cones, dried, and added to the coarser fuel. The washery processes up to 3400 tons in an 8-hour shift, turning out high-quality coke for the company's own use and for sale.

Steelcote Manufacturing Company, maker of Stainless Steel Coating, is offering under the trade name Steelast what is basically the same product but in a range of ten colors including green, red-orange, yellow and ivory. Applied by air spray, brush or dipping, it is said to withstand most chemicals and constant wet as well as dry heat up to 180° and 300°F, respectively.



Block Buster is the name of a portable sandblasting machine recently put on the market by The Corson Company, Inc. The unit can be connected to a shop air line or compressor supplying air at not less than 80 psi pressure and consumes from 30 to 35 cfm, depending on the size of the nozzle and the pressure, which is adjustable from 30 to 120 psi. It utilizes clean dry sand that will pass through a 16-gauge screen, metal or flint shot, grit, etc., and has no moving parts or mixing chambers to wear out. Suitable for use on concrete, masonry, metals, wood, plastics and glass, it has a wide range of industrial applications including such jobs as cleaning airplane parts before magnafluxing or heat-treating, as well as pipes, valves and castings; removing forging and mill scale, rust and paint from structures of all kinds, and even barnacles from ships' bottoms; and frosting and engraving plastic and glass surfaces. The Block Buster is built in three sizes holding 90, 150 and 200 pounds of sand, respectively.

Whether smooth or corrugated steel strapping is to be produced, or bands that are alternately plain and corrugated, there's a machine that turns out all three kinds by an ingenious arrangement of two sets of feed rollers—one pair plain and the other toothed—air cylinders and electronic timers. It was designed by A. J. Gerrard & Company, makers of trade-marked steel strapping from 5/16 to 1½ inches wide for large shipping cases. The equipment handles from 200 to 400 feet of steel strip a minute and is driven by a variable-speed motor. While one set of rolls is idle, pressure is brought to bear on the other by its pneumatic cylinder, which is controlled by an electrically actuated valve. But with both pairs of rollers in service when manufacturing alternately plain and corrugated strapping, the valves, in turn, are controlled by electronic timers that load and release the rollers in quick succession depending on the spacing, which may be as little as 4 inches.

SMART OPERATORS CHOOSE *LAKE SHORE* MINE CARS

FOR SAFETY . . .

THIS Lake Shore Man Haul car (left) gives 30 men a dry, safe, comfortable ride with plenty of knee and headroom — space on seats for dinner boxes. Enclosed design gives full protection. Available insulated against electricity . . . full universal oscillating trucks or conventional type.

FOR HEAVY LOADS AND ROUGH SERVICE . . .

250 cubic feet — the capacity of this tough, all-welded Lake Shore Granby type side dump car . . . designed for the extremely hard loading and operating conditions met in high production mining.

A STANDARD OF RELIABILITY . . .

THIS 38 cubic foot Lake Shore Standard side dump car has given years of trouble-free service in mines all over the country. Design is simple, time tested.

Write for more information on Lake Shore "job proven" Mine Cars and Mine Equipment.

Standard and Special Mining-Milling Machinery for Every Application.

LOHED MINE CARS

JETO BOTTOM DUMP SKIP

BICYCLE SHEAVES

LAKE SHORE Engineering Company

Look to Lake Shore for Leadership

IRON MOUNTAIN / MICHIGAN

QUOTES

—FROM HERE AND THERE

Assembly Problem Solved by Air System

"By using an air circuit on a new riveting machine, Jacques Kreisler Manufacturing Company spins rivets, which are no bigger than a pin head, 60 percent faster and much better than on the old foot operated mechanism.

"The part being assembled is the tiny snap catch for the Kreisler band that holds a lady's watch on her wrist. Using an electrically controlled, air power system, rejections have dropped to one percent of their old rate and operator fatigue has been greatly minimized."

From Applied Hydraulics, March, 1953

Ice Cream and a Skyscraper

"Who would expect that the American taste for ice-cream would cause the near collapse of a skyscraper?

"Our laboratory made the tests which proved that salt leaking for many years from an old-fashioned ice-cream storage cabinet had turned huge steel foundation beams under a famous skyscraper into crumbling rust. Further tests determined the extent to which foundations had to be replaced. The restaurant still serves ice-cream."

Frederick H. Wright, Vice President, Lucius Pitkin, Inc., in Bulletin of American Council of Commercial Laboratories, Inc.

Teeth May Be Filled by Use of Compressed Air

"Most of us have seen the dentist mix up silver amalgam—by stirring mercury into a powder containing silver, tin, copper, and zinc—and press and pack it into place to fill a tooth. Could a machine do the job equally well and save the dentist's energy?

"Mechanical packing is already used to some extent. The packer may be powered by the "dental engine" or by compressed air. The National Bureau of Standards has recognized this development by making comparisons of fillings that have been packed in by the three methods, hand, motor, and air. The hollows were cylindrical steel molds. Curing was at mouth temperature 37°C (98°F).

"Motor-driven packers produced the strongest fillings, compressed air packing the next strength, and hand packing the lowest strength. But the strongest filling lacked one important property—the ability to expand slightly in hardening and so be locked in place. Clinical tests will be needed to establish the comparative merits of the different methods of filling teeth."

From Science and Appliance, Ohio State University, April, 1953

What's Your Line?

In Mining Service...the Answer is NAYLOR

Whether your line is for high or low pressure air, water, or what have you—Naylor lightweight pipe takes the guesswork out of your piping requirements. It's your best bet for all-around service in mining operations.

Write for Bulletin No. 507

NAYLOR PIPE COMPANY
1245 East 92nd Street, Chicago 19, Illinois
New York Office: 350 Madison Avenue, New York 17, New York

THE EASIEST WAY TO MAKE ENDS MEET

VICTAULIC FULL-FLOW TEES ELBOWS AND ALL TYPES OF FITTINGS ALL WIDELY ADAPTABLE AND **EASY-TO-INSTALL** ARE ONLY PART OF THE COMPLETE MODERN **VICTAULIC 4-STAR☆☆☆☆METHOD OF PIPING.** YOU ARE ASSURED FAST, STREAMLINED EFFICIENT CONSTRUCTION THAT SAVES $$$$ WITH **VICTAULIC COUPLINGS** FOR LOCK-TIGHT, LEAK-PROOF CONNECTIONS AT EVERY JOINT UNDER PRESSURE OR VACUUM; PLUS CONVENIENT PORTABLE **VIC-GROOVER TOOLS** FOR GROOVING STANDARD PIPE ENDS WITH **SPEED** AND **EASE;** AND QUICK, HANDY **ROUST-A-BOUT COUPLINGS** FOR PLAIN END PIPE AND **ALL-'ROUND VERSATILITY.** MAKE SURE YOUR NEXT JOB IS ALL **VICTAULIC! PROMPT AVAILABILITY** FROM LOCAL DISTRIBUTOR STOCKS **COAST-TO-COAST.**

Write today for Victaulic Catalog - Manuals Nos. 44-8B

VICTAULIC COMPANY OF AMERICA · P. O. Box 509 · ELIZABETH, N. J.

Office and Plant: 1100 Morris Ave., Union, N. J. • Telephone Elizabeth 4-2141

West Coast: Victaulic Inc., 2330 East 8th St., Los Angeles 21 • *Canada:* Victaulic Co. of Canada Ltd., 406 Hopewell Ave., Toronto 10 • *Export:* Pipe Couplings, Inc., 30 Rockefeller Plaza, N. Y. 20, N. Y.

COPYRIGHT 1953, BY VICTAULIC CO. OF AMERICA

Books and Industrial Literature

Mechanical Engineering Thermodynamics is the title of a first-course textbook on thermodynamic principles and their applications in mechanical engineering. Written by David A. Mooney, now principal mechanical engineer of the Boston engineering firm of Jackson & Moreland and formerly assistant professor of mechanical engineering at Massachusetts Institute of Technology, the book covers the background and significance of laws and definitions with exceptional comprehensiveness as an aid to teaching and contains more than 230 problems each of which has been prepared to clarify the student's understanding of a specific topic. The first part of the text is a detailed exposition of basic facts and methods, and subsequent chapters deal with engineering processes involving the conversion of energy from one form to another, the transfer of energy from place to place and the storage of energy in various forms. An unusual feature of the 540-page work is the regular presentation of both gas-table and gas-law solutions, and in an appendix are tables and charts of thermodynamic data on substances, combustion and conversion of units. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York, 11, N.Y. Price, $9.35.

Anesite Company, 3575 Touhy Avenue, Chicago 45, Ill., has issued a folder giving estimated working pressures and chemical resistance of its plastic pipe, known as Black Buty, which has a diameter range of ½ to 6 inches. Fittings available and applications are listed. Copies will be supplied on request.

A 12-page illustrated bulletin on air-cooled heat exchangers for a wide variety of industrial applications is offered free by The Fluor Corporation, 2500 South Atlantic Boulevard, Los Angeles 22, Calif. Known as Fin-Fan Heat Exchangers, the units are designed to cool liquids or gases at pressures up to 5000 psi and at a maximum temperature of 1500°F. Ask for Bulletin No. FF-FD-0.001.

The 1953 catalogue on Calrod electric heaters and heating devices has been published for free distribution by General Electric Company, Schenectady 5, N.Y. Designated as GEC-1005D, the 60-page, 2-color buyers' guide gives information on installation and application, lists special features, and explains methods of determining power requirements and heat losses by graphs and formulas.

Information on its complete line of drip-proof induction motors is contained in a brochure recently announced by The Lima Electric Motor Company, Lima, Ohio. It discusses recent changes in design, optional mountings and special applications and contains speed-torque curves, frame number charts and specifications for units from ½ to 150 hp. Write to Richard R. Knierim, sales manager, for your copy of Bulletin RS-2, 10-4-52.

Booklet RE8500, a recent release obtainable from Remington Rand Incorporated, 315 Fourth Avenue, New York 10, N. Y., describes its all-purpose electric typewriter, a machine that can be used for regular work and for tabulating. It has a 10-key decimal tabulator at the base of the keyboard that enables an operator, without taking her hands from the keyboard, to shift from column to column by setting only one stop and using only one key for each tabulation.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

This hose handles 85% of all air hose jobs—lasts for years

Saves days of waiting for special hose—saves money too

HERE is the most useful air hose made. It's B. F. Goodrich Type 50, built to handle 85 out of every 100 air hose jobs, and last longer doing them. Here's why:

Oil won't rot it

The tough rubber tube withstands heated air even when it contains lubricating oil. Will not break into loose, gummy particles that clog tools. Cover is oil-resisting, too. Type 50 can be dragged through oil or grease without damage.

Rough treatment won't tear it

Cover is abrasion-resisting. Scraping over rough floors, rocks, cinders or roads won't tear it. Won't check or crack from constant sunlight.

Long lasting

Resistance to heat and hard knocks is vital in the foundry pictured above. But in spite of rough treatment, that length of Type 50 has been in service 25 years now, still looks good for a lot more use. B. F. Goodrich Type 50 is also recommended for shop tools, tampers, fixed and portable compressors, air hoists, quarry and mining service.

B. F. Goodrich distributors have Type 50 for immediate delivery, but if you would like more information before you buy, send the coupon below for a descriptive folder. No cost or obligation, of course.

Air Hose BY
B.F.Goodrich

The B. F. Goodrich Company
Dept. M-33, Akron 18, Ohio

☐ Please send more information on B. F. Goodrich air hose.

☐ Have a BFG distributor call on me.

Name_____

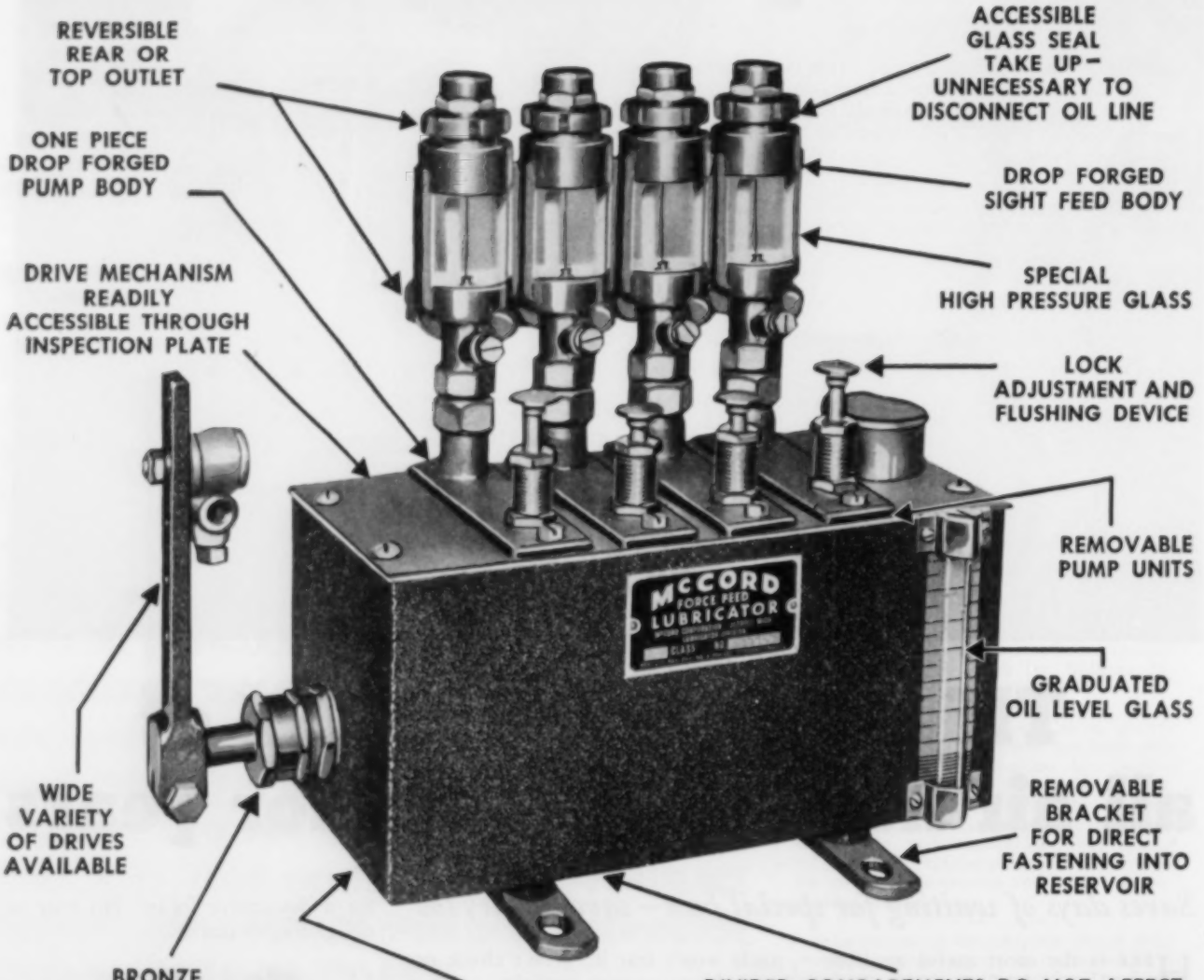
Company_____

Address_____

City_____ Zone_____

State_____

SUPERIOR FEATURES OF McCORD "SF" LUBRICATORS


REVERSIBLE REAR OR TOP OUTLET
ONE PIECE DROP FORGED PUMP BODY
DRIVE MECHANISM READILY ACCESSIBLE THROUGH INSPECTION PLATE
WIDE VARIETY OF DRIVES AVAILABLE
BRONZE END BEARING SUPPORTS
WELDED STEEL TANK
DIVIDED COMPARTMENTS DO NOT AFFECT MAXIMUM NUMBER OF FEEDS IN RESERVOIR
ACCESSIBLE GLASS SEAL TAKE UP— UNNECESSARY TO DISCONNECT OIL LINE
DROP FORGED SIGHT FEED BODY
SPECIAL HIGH PRESSURE GLASS
LOCK ADJUSTMENT AND FLUSHING DEVICE
REMOVABLE PUMP UNITS
GRADUATED OIL LEVEL GLASS
REMOVABLE BRACKET FOR DIRECT FASTENING INTO RESERVOIR
McCORD FORCE FEED LUBRICATOR

McCORD "SF" AN OUTSTANDING DEVELOPMENT IN MECHANICAL FORCE FEED LUBRICATORS

The outstanding McCord features are shown in the illustration. You will readily appreciate the importance of these features from the standpoint of dependability and accessibility. Most of the features are McCord developments, and are only found on McCord lubricators. The new improved clear sight feed provides better visibility and is less susceptible to clouding. Due to its design, it carries a greater supply of liquid. It can be cleaned without removing from pump or disconnecting it from the oil line.

The differential plunger, optional equipment with the "SF", enables you to obtain a much finer feed adjustment than with the straight plunger type pump. This is extremely important when maximum efficiency is dependent upon minimum unfailing oil delivery.

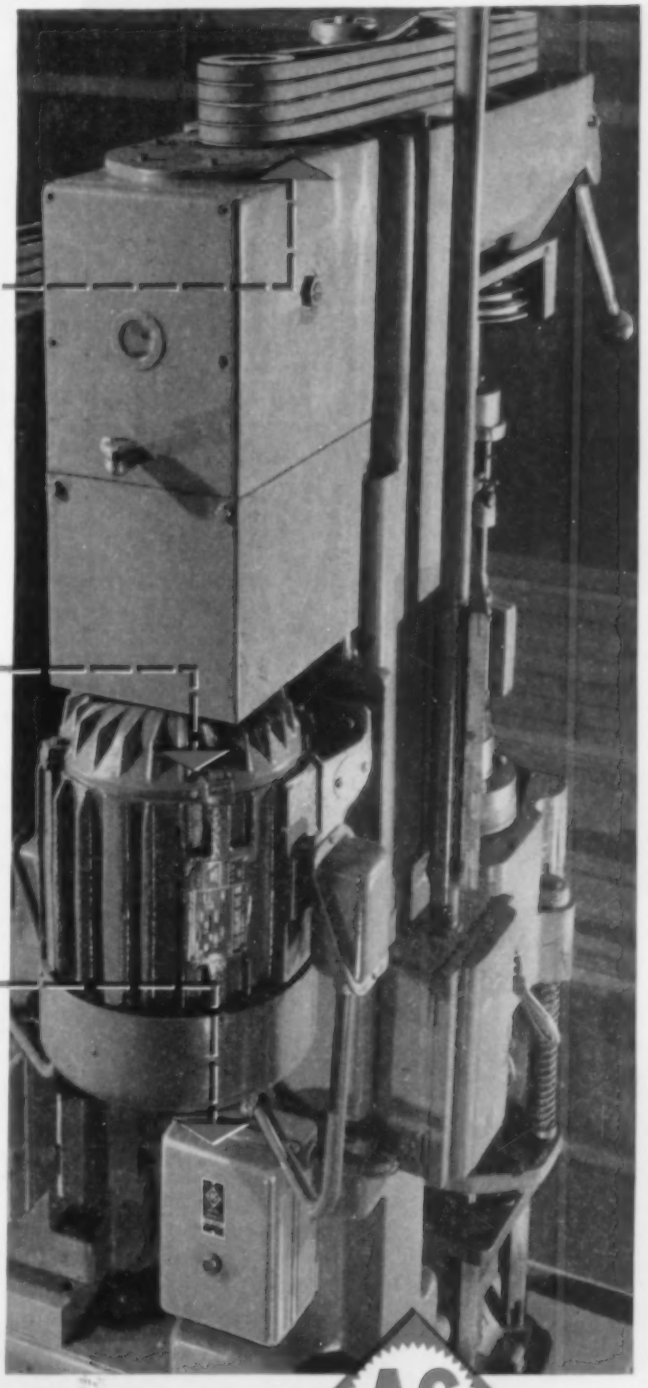
The "SF" feed adjustment is not affected by vibration because it is locked in position. These features, along with individual, removal pump unit, drop forged steel and brass parts, hardened ground steel plungers, welded steel tanks, and new type graduated oil level glass, make McCord an outstanding lubricator.

McCORD CORPORATION • DETROIT 11, MICH.

Designed to Work Together

Texrope Drives

Texrope V-belt drives, the original multiple V-belt drive, are available in a complete range of types and sizes, both fixed and variable speed. More and more machine designers are finding the moderate cost of *Vari-Pitch* sheaves is returned many times in increased machine versatility and more precise quality control. With either Stationary Control or Motion Control *Vari-Pitch* sheaves, speeds can be accurately adjusted quickly and easily over a wide range.



Motors

The increasingly high cost of maintenance labor has made the use of totally-enclosed, fan-cooled motors on machine tools more popular — and more profitable — than ever. This Allis-Chalmers TEFC motor is especially well suited to this application because it has no enclosed cooling air passages. Since all cooling surfaces are exposed, the motor is easy to clean with cloth, air or vacuum cleaner. Even with the oily atmosphere of many machine shops, dirt wipes off easily.

Motor Control

Allis-Chalmers motor control is available for most designers' applications from size 0 up. Allis-Chalmers builds many types of squirrel cage and wound rotor motor control, dc motor control and variable speed control for many applications. Shown here is a full voltage across-the-line starter with reset button.

Nation Wide Service

Nearly 100 Allis-Chalmers Certified Service Shops throughout the country provide factory-approved parts and service on Allis-Chalmers drive equipment. Complete information on special equipment also is provided.

Get the help of your Allis-Chalmers District Office representative on your drive plans. Call him or write for Bulletins 51B6052, 20B6051, and 14B7733. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4005

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

EXCLUSIVE FEATURES MAKE EIMCOS

1st Choice to Cut Loading Costs

Eimco has always been first to provide low cost economical loading equipment. Among the features that make Eimco first choice with all users of these machines are:

1st to use simplified construction. Eimco uses from 40% to 60% fewer parts in construction.

1st to use alloy steel castings throughout. Eimco is the only loader with main castings made of alloy cast steel.

1st to build in safety features. Eimco's design incorporated 15 or more protective features for benefit of the operator.

1st to provide a coupler for your car. In spite of the fact that couplers are an essential factor in loading speed, Eimco is the only manufacturer who designs and builds a special coupler to fit each customers car.

1st to provide full loading of your car. Eimco, through selective assembly, is the only manufacturer that can tell you you'll get your car loaded full all the way back and mean it.

1st to provide buckets engineered to your muck and car. It takes a special bucket to do a special job.

1st to supply a machine that tunnel contractors could use to help them establish world tunneling records.

And 1st on many other important features that make and keep Eimcos the leading rock loader.

You Can't beat an Eimco

EIMCO A455

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES – SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY EIMCO ITALIA, S.P.A., MILAN, ITALY

Loading sand on construction job.

PRODUCTION UP COSTS DOWN

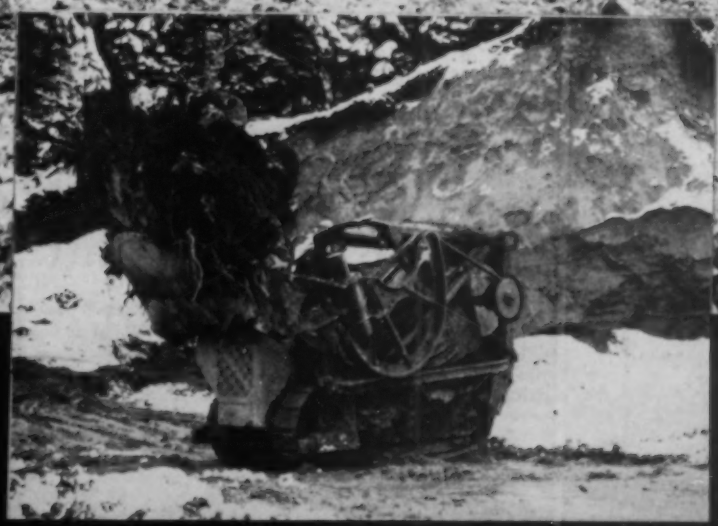
Loading rock in Eastern quarry.

Tough loading jobs that incorporate loading of sand, rock, frozen ground, narrow passage ways, long hauls to discharge or any combination of disagreeable and hard to manage operations are easy for an Eimco.

These heavy-duty machines are at home in a rock pile — they'll load big or small trucks and operate in a space where no tractor can turn around.

Write for information on Eimcos, how they can load for you at unusually low cost and at a rate of 250 to 350 tons per hour.

You Can't beat an Eimco



Construction job in frozen ground.

EIMCO A456

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

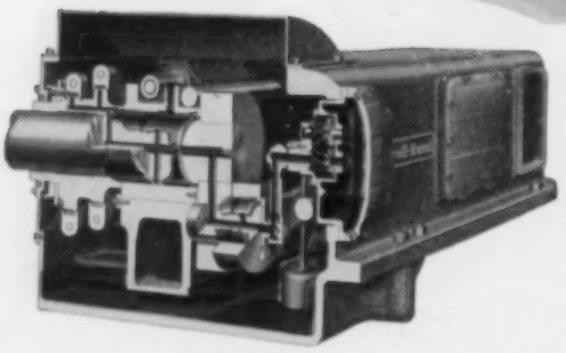
EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE. • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA, S.P.A., MILAN, ITALY

Sets the Standard for STEAM-POWERED COMPRESSORS



This cross-section through one of the main bearings of the new XPV shows its unique lubrication system. The combination oil-pump drive and distribution system (patented) supplies oil through drilled passages directly to the crankpin and main bearings, valve-gear eccentrics, and crossheads.

All of the oil discharged from the pump passes through a fine-mesh bronze filter before entering the distribution system. The oil stays clean and bearing surfaces are protected.

Because the frame is sealed, oil stays in; and dust and dirt stay out. The oil in the crankcase keeps clean, and the smooth contours of the frame make it easier to keep clean outside.

Ever since the first steam-powered compressor of "4-corner" construction was built by Ingersoll-Rand in 1900, I-R "steamers" have been the standard of comparison. Through the following years, other models introduced such precedent-breaking improvements as: balanced piston-valve riding cut-off steam end, double-crosshead and tie-rod construction, and Channel Compressor Valves.

The new XPV sets a truly new standard of comparison. Many of the outstanding features of the old XPV have been retained because of their advantages. Many improvements have been introduced to make a superior compressor.

One of the outstanding features of the new XPV is its full-floating bearings. Main, crankpin, and crosshead-pin bearings are all free to rotate; rubbing speeds are reduced, and bearing loads and lubricant are distributed evenly around the entire bearing surface both inside and out. The wear on these non-adjustable bearings is almost non-existent, and the sealed, dust-tight frame need be opened only for inspection.

Part by part, and as a complete unit, the new XPV has been designed to compress air or gas with the greatest over-all efficiency. For further information ask the nearest I-R branch office for Bulletin 3444-A. Call upon Ingersoll-Rand engineers to prove why you should use this new XPV, the new standard of comparison.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 578-T

Typical installation of American Hammered Conformable Oil Rings

AMERICAN HAMMERED CONFORMABLE OIL RING

Insures constant unit pressure for positive oil control!

You keep your oil consumption down when you install Koppers American Hammered Conformable Oil Rings! This service-tested piston ring conforms readily to meet cylinder distortion because its flexible cast iron member is pressed outward by an abutment type spring which exerts uniform radial pressure around the entire circumference.

Narrow bearing surfaces on either side of the channel give the ring a uniform unit pressure on the cylinder, enabling it to seat promptly and assuring maximum removal of excess oil throughout its lifetime. And the Conformable Oil Ring has a longer useful life because its low spring rate and uniform lands result in negligible changes in pressure as the ring wears

Easily installed, it is ideal for both 2-cycle and 4-cycle Diesel & Gas engines; comes in 4″ to 25″ diameters with a minimum width of ¼″. Write, wire or phone us today for full information on how the Conformable Oil Ring can improve *your* operation . . . or for expert help in *any* piston or sealing ring problem. KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1516 Hamburg Street, Baltimore 3, Maryland.

KOPPERS®

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland

This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers-Elex Electrostatic Precipitators and Gas Apparatus.

Engineered Products Sold with *Service*

AMERICAN HAMMERED *Industrial Piston Rings*

KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1516 Hamburg Street, Baltimore 3, Md.

Gentlemen: Please send me full information on your Conformable Oil Ring.

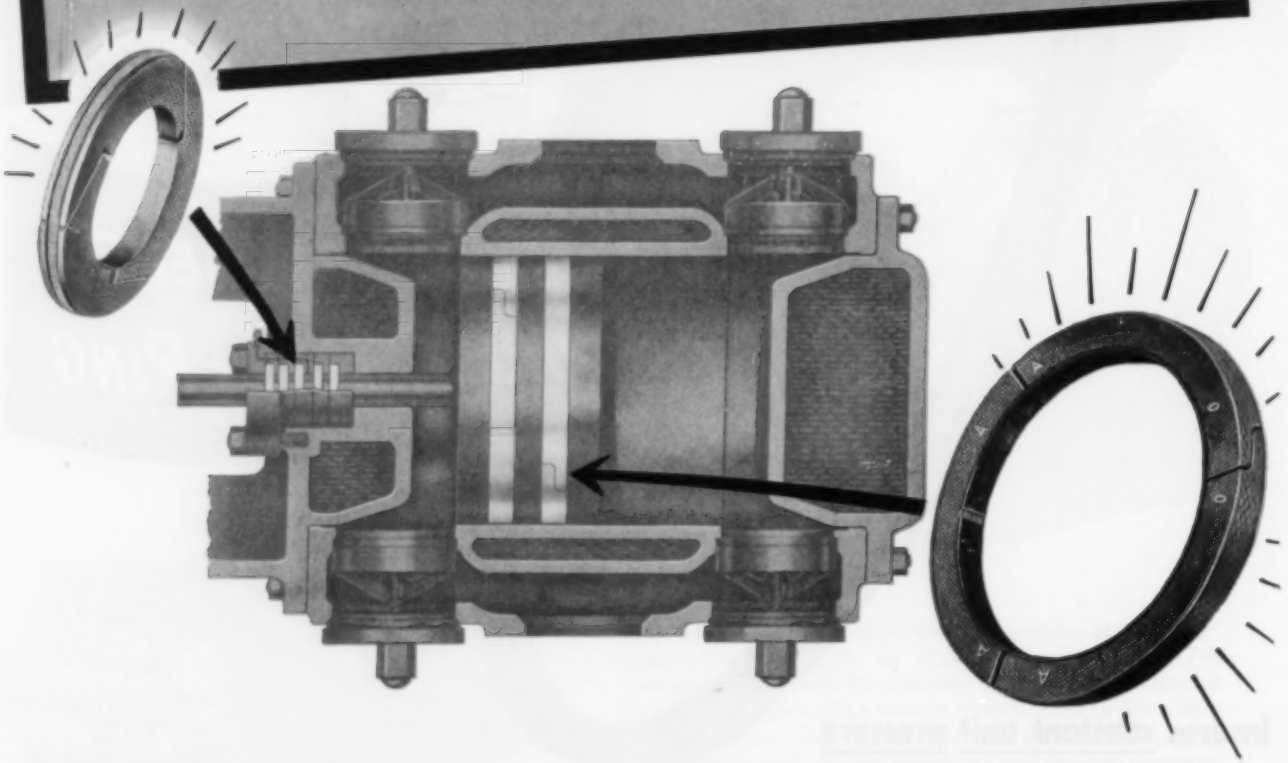
Name ----------

Company ----------

Address ----------

City ---------- Zone ---- State ----------

Corrosive gas conditions call for COOKROC Packing and Piston Rings



COOKROC rings have established a record for dependable, troublefree service in compressors handling gases with high H_2S concentrations and gases burdened with hydrocarbon vapors.

Their successful performance is due to two basic factors. First, they are made of Laminated Bakelite, a hard, dense and durable material which is extremely resistant to the attack of corrosion and which has topflight bearing qualities. Second, they are manufactured under the same high standards of precision and workmanship that have made Cook Metallic Packings and Piston Rings the choice of compressor operators and builders the world over.

AT THE INTERNATIONAL PETROLEUM EXPOSITION see these and other Cook piston rings and packings at BOOTHS No. 51 and 52 in the Texas Building. C. Lee Cook headquarters will be located in the Tulsa Hotel in Tulsa.

C. Lee Cook Mfg. Co., Incorporated, Louisville, Ky. Branch offices in Baltimore, Boston, Chicago, Cleveland, Houston, Los Angeles, Mobile, New Orleans, New York, San Francisco and Tulsa.

. . . SEALING PRESSURES SINCE 1888 . . .

where

MISALIGNMENT

can't be helped . . .

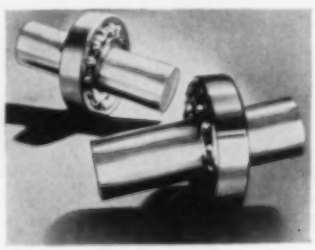
you'll find

SKF

Spherical

Roller Bearings

See how the raceway of the outer ring of this SKF Spherical Roller Bearing forms a section of a sphere. This principle of design of the SKF self-aligning bearings compensates for misalignment due to shaft deflection under load, distortion of the foundation, or other causes.



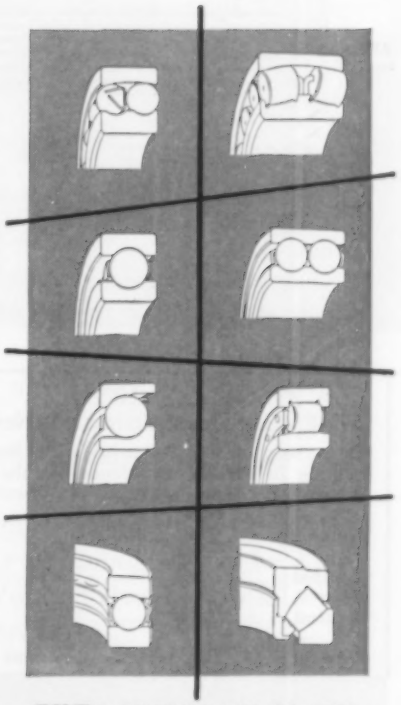
This illustration shows how the principle is also applied to ball bearings, enabling SKF Bearings to operate satisfactorily at high speeds even when some shaft misalignment exists. (The misalignment is exaggerated for clarity.)

Suitable for very heavy radial and thrust loads, SKF Spherical Roller Bearings, like all SKF Bearings, are held well within established tolerance limits, carefully cleaned, protected from rust, and available with cylindrical and taper bores and adapter mountings.

SKF bearings are serving virtually all industry. SKF's unmatched Field and Home Office engineering service helps product designers *put the right bearing in the right place.* **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA.—*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7401

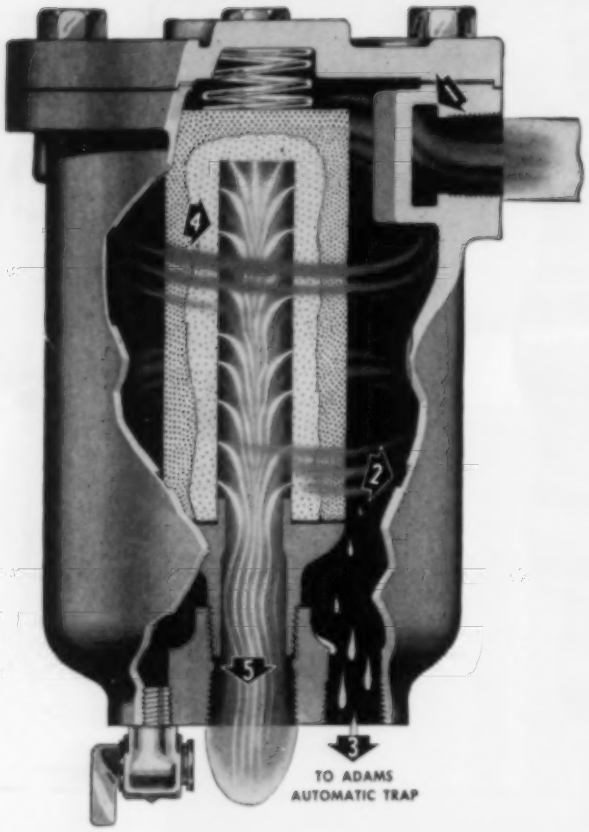
SKF®

BALL AND ROLLER BEARINGS



SKF'S COMPLETE LINE OF ANTI-FRICTION BEARINGS, PLUS **SKF** ENGINEERING CO-OPERATION, HELPS YOU *PUT THE RIGHT BEARING IN THE RIGHT PLACE.*

ADAMS *has both* *



—— BOTH ANSWERS TO THE PROBLEM OF KEEPING WATER, WATER VAPOR, OIL AND DIRT OUT OF COMPRESSED AIR LINES

There's no *one* answer to this problem! The most expensive aftercooler you can buy will not remove scale that is picked up in the distribution lines. The most expensive air filter you can buy cannot guarantee removal of water vapor until it has been condensed by cooling. That's why Adams makes both.

* PORO-STONE *AIR FILTER*

1. Centrifugal separation of dirt and liquids.
2. Drainage to trap directed by vertical cast-in slots.
3. Continuous, fully automatic trap action.
4. Rapid diffusion and filtration through permanent, cleanable Poro-Stone.
5. Clean, dry air at practically unchanged pressure. Standard, stocked sizes handle from 10 to 700 cfm.

Easily installed in either vertical or horizontal pipe line.

* *AFTERCOOLER AND CYCLONE SEPARATOR*

Cools air to within a few degrees of cooling water, making certain that compressed air is colder than surrounding atmosphere, so that no further condensation can take place.

Counter flow, air-through-tube design assures continuously high heat transfer rate.

Double cyclonic action deposits all water and entrained oil in moisture chamber.

R. P. ADAMS CO., INC.
209 E. Park Drive, Buffalo 17, New York

Please send me your latest literature, Bulletin No. 176 on BOTH the Poro-Stone air filter and the Adams Aftercooler — Cyclone Separator.

Name.....

Company..... *Title*.....

Address.....

City..... *State*.....

FOR YOUR PROFIT'S SAKE — FIND OUT ABOUT BOTH

R. P. ADAMS CO., INC., BUFFALO 17, N. Y.

Wire Rope at Work—As you draw near New York City at the northern end of the 118-mile New Jersey Turnpike, this is the bridge that carries you high above the Passaic River. The picture, taken at a time when the bridge was near completion, shows two 146-ton girders for the main span being lifted simultaneously into place by Bethlehem Wire Rope.

These heavy steel girders made a tough lift, but no tougher than thousands of others entrusted to Bethlehem rope all over the country. Wherever there are heavy lifting or hauling jobs to be done, you will find Bethlehem rope right in the thick of things, hard at work. You will always know it by the black-and-yellow reel, the reel that tells you, "Here a good product is in service."

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:
MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

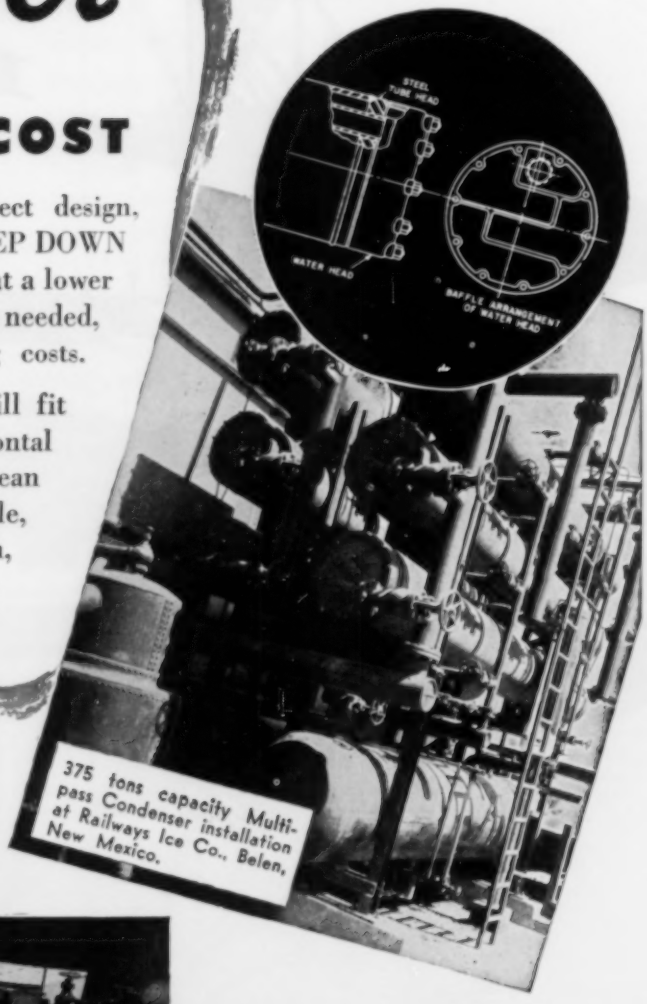
$ave Power and REFRIGERATION COST

Vogt Condensers, because of their correct design, STEP UP the rate of heat transfer and STEP DOWN head pressures. With the liquid delivered at a lower temperature, smaller compressor capacity is needed, saving in original as well as operating costs.

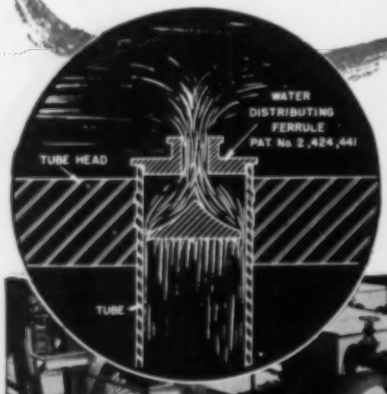
One of the two basic types illustrated will fit your operations exactly. Install Horizontal Multipass (closed type) for use with clean waters. Where the water is hard, forms scale, contains mud or promotes fungus growth, Vertical Single Pass (film type) which can be cleaned in operation, are recommended.

Horizontal Multipass Condensers
(Closed Type)

Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.

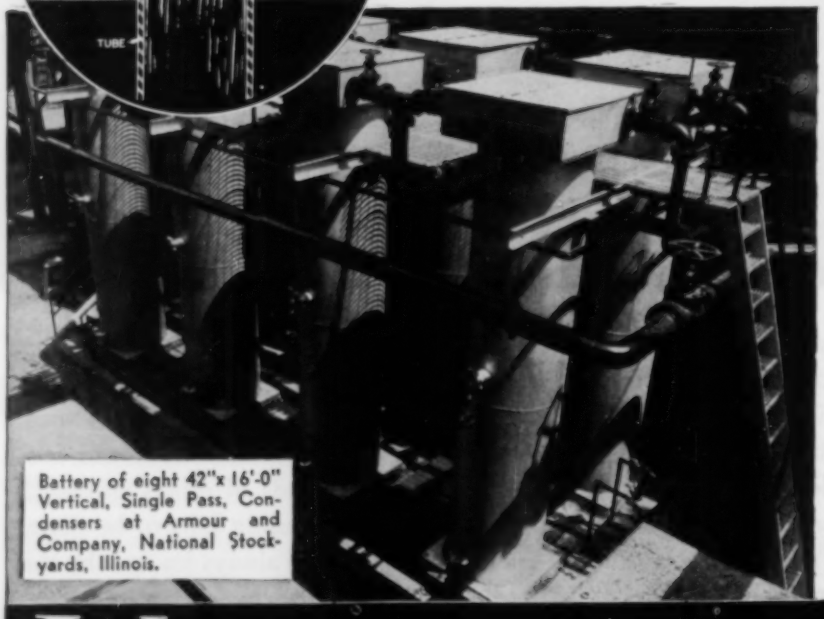


375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.



Vertical Single Pass Condensers
(Film Type)

Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.



Battery of eight 42"x 16'-0" Vertical, Single Pass, Condensers at Armour and Company, National Stockyards, Illinois.

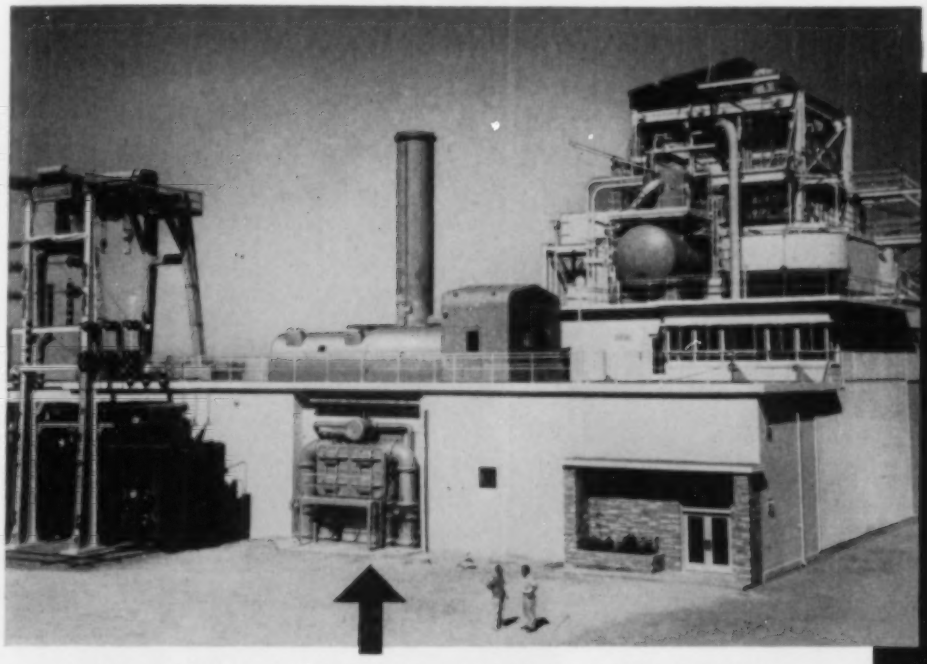
HORIZONTAL and VERTICAL TYPES SHELL and TUBE CONDENSERS For Every Service

Write For Bulletin RC-1

HENRY VOGT MACHINE COMPANY
INCORPORATED
1000 W. ORMSBY ST., LOUISVILLE 10, KY., U.S.A.
Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

Vogt REFRIGERATION CONDENSERS

Salt River Power District Installs I-R Rectangular Condensers in unique, outdoor-type steam plant



NEW KYRENE POWER PLANT, designed to take advantage of Arizona climate conditions, saves valuable under-turbine space with Ingersoll-Rand Rectangular Condensers

This 27,500 sq. ft. I-R Rectangular Condenser serves Unit No. 1, a 30/33,000 kw turbine-generator, at the new Kyrene Steam Plant of the Salt River Power District.

The new Kyrene Steam Plant, near Phoenix, Arizona, is the latest addition to the Salt River Power District's combined steam, hydro and diesel power generating system.

Designed and built by the Bechtel Corporation, the Kyrene Station differs from the conventional outdoor installation in that the maintenance shops and auxiliary equipment are under cover for the comfort and convenience of operating personnel. All other elements of the station are of the outdoor type resulting in maximum economy of construction for the Arizona climate.

Unit No. 1—a 30/33,000 kw turbine-generator with throttle conditions of 850 psig, 900F—is supplied by a 350,000 lb. per hr. steam generator, designed to burn natural gas automatically, fuel oil manually, or coal or lignite on conversion. The turbine is served by an Ingersoll-Rand Rectangular Condenser containing 27,500 sq. ft. of cooling surface. Condenser cooling water is handled by two I-R vertical pumps handling 25,800 gpm. Condensate is handled by I-R vertical pumps.

Unit No. 2, now under construction, will have a rating of 60/66,000 kw. It will be served by a 47,500 sq.ft. I-R Rectangular Condenser, also of two-pass and vertically divided design. The condensate and circulating pumps will again be supplied by Ingersoll-Rand.

These Ingersoll-Rand Condensers save valuable space because their *rectangular design* makes the most efficient use of the rectangular space available below the turbine. And installation cost is minimized because they are completely assembled in the shop, then shipped in large sections, completely flanged for easy erection without any field fitting or strength welding.

Ingersoll-Rand

868-4 11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

WHAT *Life-Line* REALLY DELIVERS IS MORE SERVICE... LESS SERVICING

So quiet you almost hear the temperature drop!

Air-conditioning equipment should be "felt", not "heard". That's where you get an important advantage with Life-Lines—quiet, vibration-free operation.

Take the smooth-running Life-Line motor. You can actually edge balance a coin on a Life-Line through a start, run, stop cycle. It's that smooth running! The reason? Instead of trying to dampen out noises that may exist, noises have been minimized through motor design, accuracy of manufacture and careful balancing of parts to avoid vibration. Quietness of operation is assured.

Unique starter design reduces electrical and mechanical noises to a new low. Important also is positive action of knife-edge bearing maintaining precise contact alignment. Here, too, quietness is assured.

Together, Life-Line motors and Life-Linestarters® offer you a new concept of motor and control performance. You get more service . . . with less servicing. Ask your Westinghouse representative for complete details on both, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21683-A

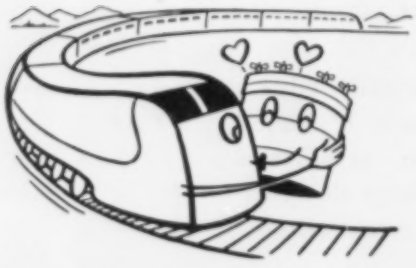
YOU CAN BE SURE...IF IT'S

Westinghouse

AIR-MAZING FACTS

BY O. SOGLOW

HOW STARS ARE REALLY BORN. They aren't!! They just grow and grow and grow. Astronomers say that pieces of dust floating in space unite with other pieces, keep growing bigger and bigger until they form a protostar—a baby star!



LOCOMOTIVES LOVE 'EM! Diesel locomotives run better, last longer when they're equipped with Air-Maze oil-bath filters on engine air intakes. They are typical of the many types developed by Air-Maze for specific industries.

MUM'S THE WORD! Air rushing through engine and compressor intakes often sets up disturbing sound waves. Air-Maze filter silencers muffle the noise, help employees work better, keep the neighbors happy.

WHETHER YOU BUILD OR USE engines, compressors, air-conditioning and ventilating equipment, *or any device using air or liquids*—the chances are there is an Air-Maze filter *engineered* to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 28, Ohio.

AIR-MAZE

The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

Engineered Air Regulation

KENDALL MODEL 30

Precision Air Pressure Regulator
AVAILABLE ¼" or ⅜" N. P. T.
RANGES 0-10, 30, 60, 100 PSIG
Send for BULLETIN 9523

FIRST TRUE HIGH PRECISION AIR PRESSURE REGULATING VALVE AT NEW LOW COST

FEATURES:
☆ Perfect Balance — complete immunity from upstream pressure changes ☆ Large Flow Capacity (35CFM) — automatic relief — flow compensation ☆ Small Physical Size ☆ Removable Stainless Steel Valve Trim ☆ Deep Convolution Constant Area Diaphragms made by our own Bellofram Division ☆ Aircraft Quality materials and finishes ☆ Adaptable to all types of mounting ☆ New Low Unit Cost

APPLICATIONS:
☆ Instrument service—internal and external
☆ Pneumatic gauges ☆ Paint sprayers ☆ Machine shop use
☆ Diaphragm and cylinder air loading

KENDALL CONTROLS CORPORATION
144 MOODY STREET WALTHAM 54, MASS.

40% higher HP rating

Woods **SUPER V-BELTS**

- **Rated 40% above standard—fewer belts, less maintenance**
- **Continuous strength member has high strength with low stretch**
- **Notches dissipate heat, increase flexibility and flex life**
- **Very efficient on small pulleys, short-center, high-speed drives**
- **Straight sidewalls—impregnated elastic cover**
- **Available in A, B, C, D & E cross sections**
- **All belts oil resisting and available static conducting**

For further information write for literature or consult your Industrial Distributor.

T. B. Woods SONS CO.
CHAMBERSBURG, PA.

Mechanical Power Transmission Manufacturers—Since 1857.

CAMBRIDGE, MASS. • NEWARK, N. J. • DALLAS, TEXAS • CLEVELAND, O.

GM DIESEL
CASE HISTORY No. 5211-4

USER: R.L. Coolsaet Construction Co., Dearborn, Mich.

INSTALLATION: GM Diesel-powered Ingersoll-Rand 600 cfm rotary compressor replacing a 500 cfm compressor, supplies air to a tractor-mounted multiple drill—six drills 12" apart.

PERFORMANCE: Previous Diesel compressor supplied 75 lbs. of air to each drill and took time to build up pressure after each move. GM-powered compressor supplies steady 95 lbs., starts drills immediately and saves 20% in fuel costs. Unit drills 600 lineal ft. per day.

NEW GM DIESEL-POWERED RIG CUTS PAVEMENT-BREAKING TIME IN HALF

R. L. Coolsaet figures his pavement-breaking time is cut right in half with this rig when compared to the old way with one man on each drill. Now he drills six holes at once—gets twelve holes drilled in six feet and moves up for the next series, all in three minutes, and one operator handles the job.

This is another good example of how General Motors Diesel-powered equipment gets work done faster and reduces costs at the same time. Two-cycle operation delivers a smoother, steadier flow of power—gives instant response to overcome sudden load changes. Simple design makes it easier to maintain—lower-cost parts make it cheaper to maintain. Add it up and you'll see why GM Diesels give you power at the lowest cost per horsepower hour—for *any* job.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS · DETROIT 28, MICHIGAN
SINGLE ENGINES . . . 16 to 275 H.P. MULTIPLE UNITS . . . Up to 840 H.P.

It pays to standardize on

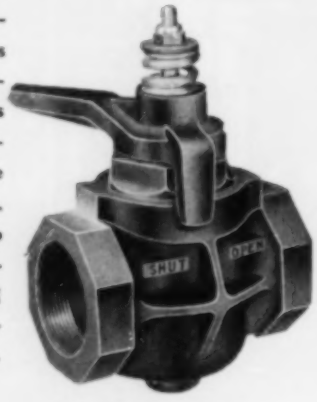
GM
GENERAL MOTORS
DIESEL
POWER

Write for booklet "A 50,000,000 Horsepower Insurance Policy" that tells you why.

NO MORE VALVE TROUBLE FROM SAND AND SILT!

Here's the valve that's proving itself the ideal one for all compressed-air service where grit, silt or abrasive-dust find their way to the valve seat.

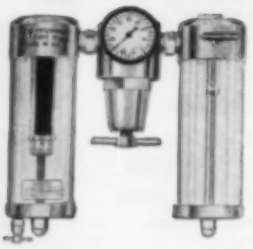
DeZURIK EASY-OPERATING PLUG VALVES beat this problem through their exclusive rubber-faced plugs—plugs that provide a dead-tight, cushioned closure even with solids on the seat. There's no seat-scoring, no plug distortion, no lubrication . . . . and no leakage! There's a DeZurik Valve for every job; write for complete catalog.



DeZURIK SHOWER CO.
SARTELL, MINNESOTA

Prominent User Acclaims

"M-B" Automatic Air Line FILTER, REGULATOR and LUBRICATOR Assembly



The value of "M-B" Automatic Air Line Filters, Regulators and Lubricators is widely known for their effectiveness as a protection to Air Valves, Cylinders, Pneumatic Tools, etc.

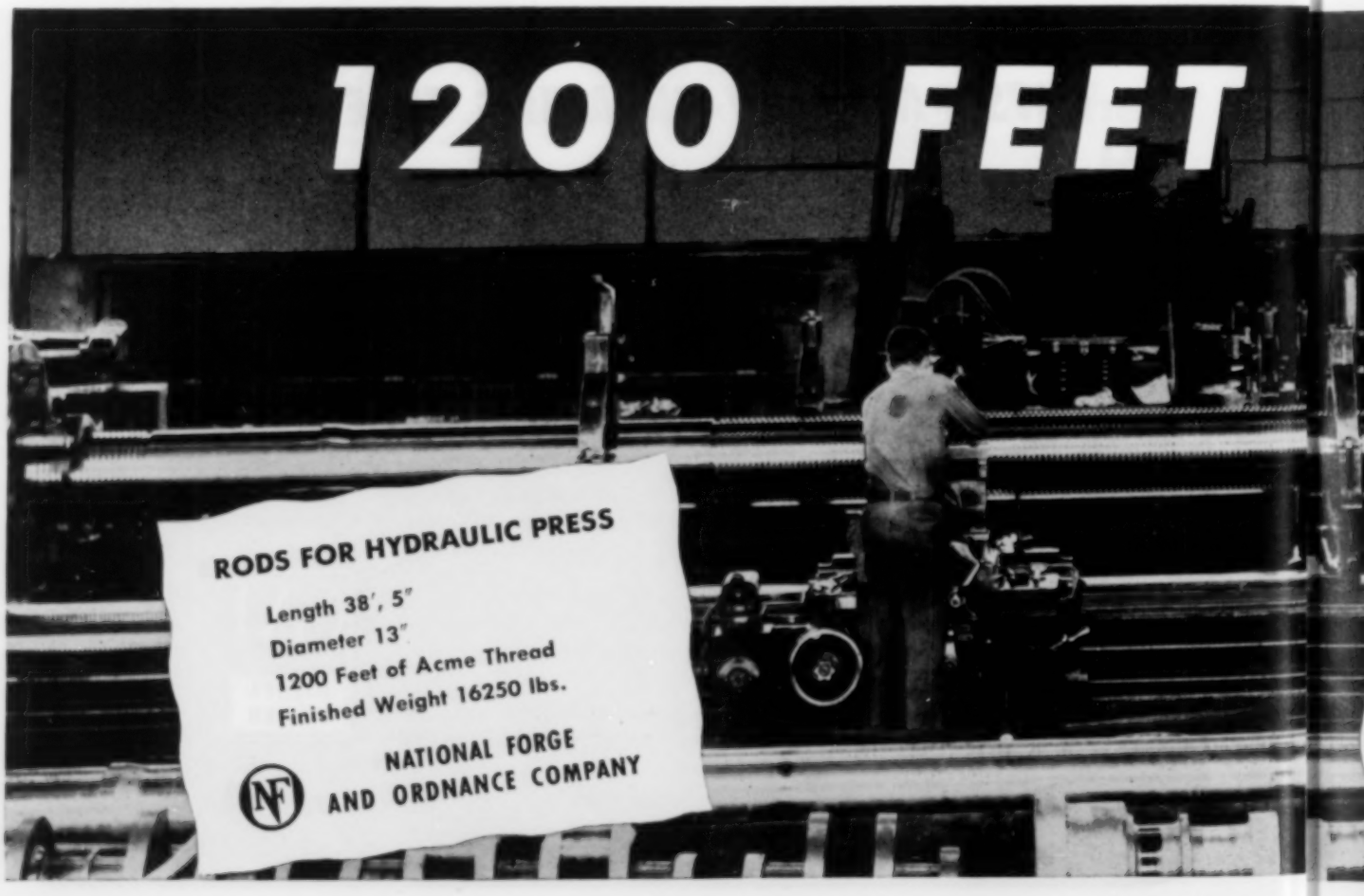
"Your 'Sentinel of the Air Line' has been giving us very good service. We have had no complaints at all and I trust that we will be ordering more of them in the near future."

signed: A. E. Cranston, Sr.
PRESIDENT

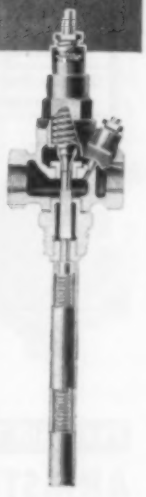
Cranston Steel Strapping Co.
Oak Grove, Oregon

WRITE FOR LITERATURE

M·B PRODUCTS
46 Victor Ave.
DETROIT 3, MICHIGAN



CUT Cooling Water Consumption 50% —increase compressor efficiency



Schramm water-cooled, stationary air compressors, as shown, are equipped with Sarco rigid stem cooling controls, type TR-44R, as a recommended accessory.

These controls cut the water consumption to what is actually needed to protect the compressor.

They prevent impaired lubrication, often the result of overcooling. They are installed directly in the water piping, take up no extra space—require no attention. A Sarco strainer is installed ahead of the control valve.

Write for Technical Bulletin No. 5 to *Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.* Advt. 614

REDUCE BULK STORAGE LABOR AND EXPENSE...

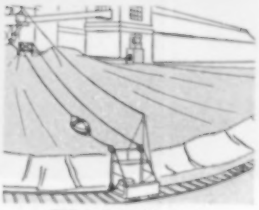
SAUERMAN POWER SCRAPERS

Stockpiling raw or processed materials, crushed ores, stone, clay, chemicals, salt, sugar, fertilizers, coal, etc.—indoors or outside—it's all the same to the versatile Sauerman Power Drag Scraper. And just one easily-trained man can do your particular job quickly, efficiently —at considerable savings to you!

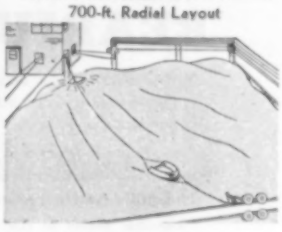
Sauerman Scraper equipment is mechanically simple, seldom needs repairs, is reasonable in cost. With a single machine you cover a large space, storing and reclaiming at the push of a lever.

Write for free, illustrated catalog on bulk handling methods.

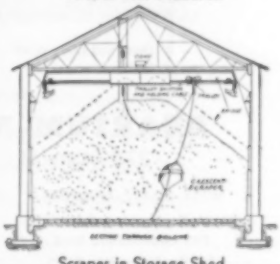
SAUERMAN BROS. Inc.
548 S. Clinton St.
Chicago 7, Ill.



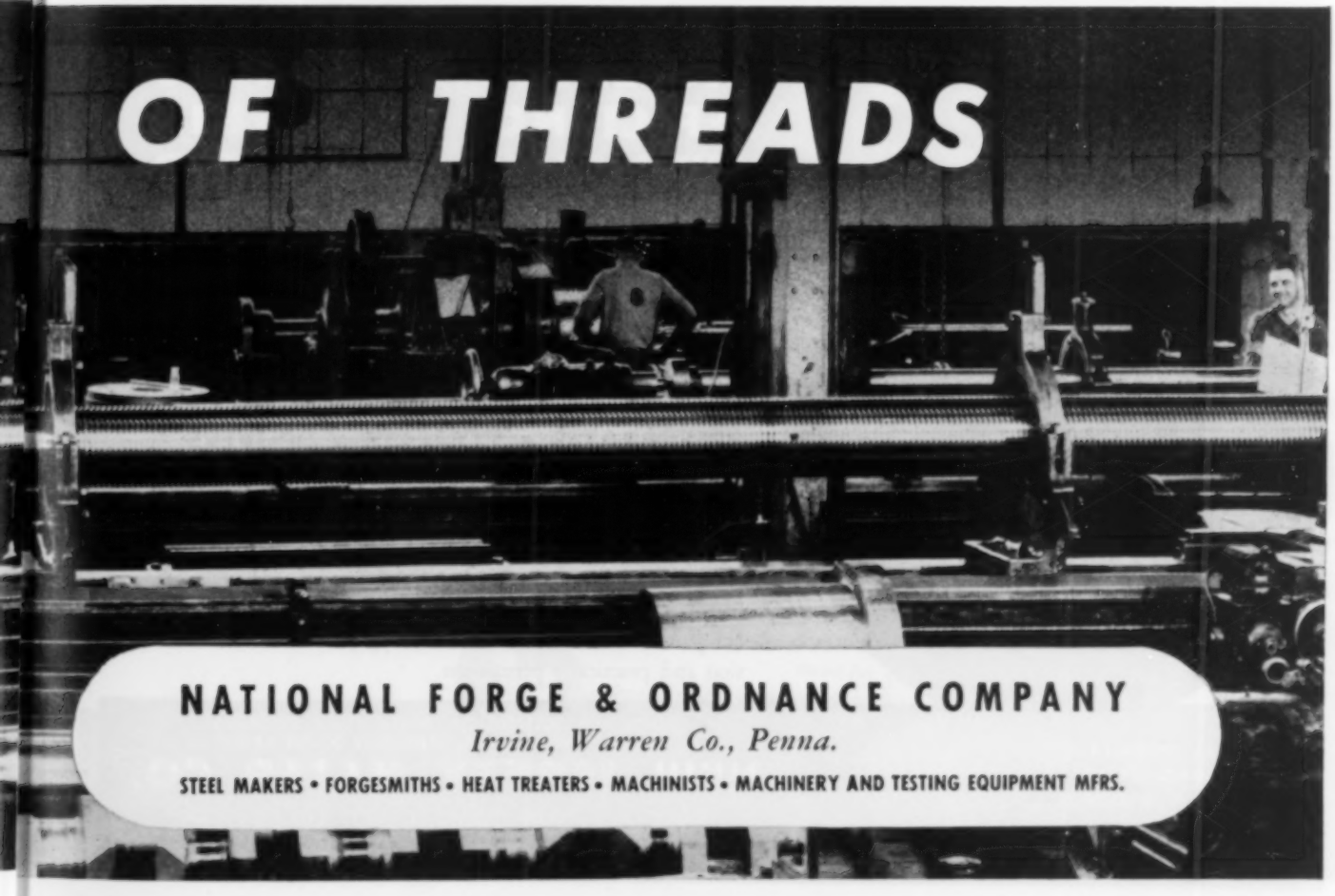
700-ft. Radial Layout



Scraper with Monorail



Scraper in Storage Shed



NATIONAL FORGE & ORDNANCE COMPANY

Irvine, Warren Co., Penna.

STEEL MAKERS • FORGESMITHS • HEAT TREATERS • MACHINISTS • MACHINERY AND TESTING EQUIPMENT MFRS.

AMAZINGLY SUPERIOR BEARING BRONZE

BEARIUM METAL

WHAT USERS SAY: "*Bearium Metal* has not cut out under . . . granite dust . . . as had babbitt; neither has the shaft cut or worn."

". . . *Bearium* proved to be such a tremendous improvement over other metals that we have authorized its use for all outside machinery throughout our fleet." (20 trawlers)

"*Bearium Metal* in our gear-cutting machine has disclosed no appreciable wear after having operated continuously . . . carrying a load of 54 tons."

★ Does not seize shaft ★ Prevents bearing failures
★ Will not score ★ Increases bearing life

Write for Full Information

BEARIUM METALS CORP.
270 State St., Rochester 14, N. Y.

WEST COAST AFFILIATE:
Nevin Engineering Associates
932 Chautauqua Blvd.
Pacific Palisades, Calif.

IN CANADA:
Bearium Metals of Canada, Ltd.
155 George St.
Toronto 2, Canada

HOW TO GET BETTER COMPRESSED AIR DRAINAGE!

USE THE RIGHT TYPE TRAP FOR THE JOB!

TYPE OF TRAP	SNAP ACTION (Fig. 1)	REGULAR BALL FLOAT (Fig. 2)	INVERTED BUCKET (Fig. 3)
Handles oil?	Light oil only	No	Very well
Handles dirt?	Moderate	No	Very well
Air loss?	None	None	Small
Requires priming?	No	No	Yes
Float collapse or leakage?	Remote	Remote	Impossible
Gravity drainage to trap required?	Yes	Yes	No

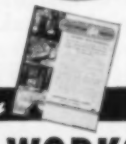
FIG. 1

FIG. 2

FIG. 3

GET THE FACTS:

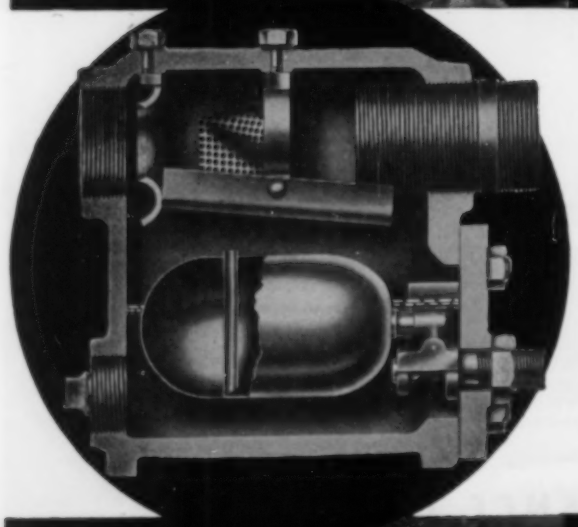
FREE AIR TRAP BULLETIN *Send Today*



ARMSTRONG MACHINE WORKS
885 Maple Street, Three Rivers, Mich.

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

INCREASED PNEUMATIC EFFICIENCY WITH THIS AUTOMATIC SEPARATOR



PROTECT EQUIPMENT WITH

DRIAIR

SEPARATES • COLLECTS • DELIVERS

• DriAir separates and automatically ejects the condensed water and oil from compressed air lines, collects pipe scale and rust, delivers clean dry air to tools and other pneumatic equipment. This promotes better lubrication, reduces wear, increases life of tools and produces greater output. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent.

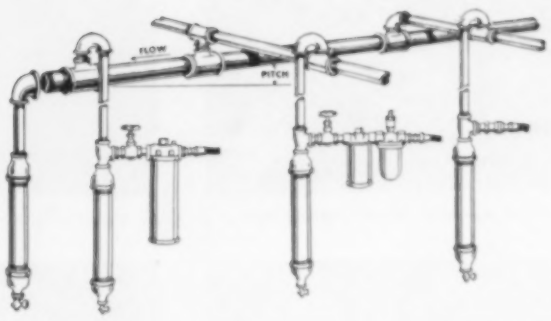
A TYPICAL INSTALLATION SHOWING DRI AIR STANDING ON A CONCRETE FLOOR NEXT TO THE WALL.

WRITE FOR BULLETIN DA WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

NEW JERSEY METER CO.
"SPECIALISTS IN COMPRESSED AIR DEVICES"
PLAINFIELD, NEW JERSEY

HANSEN REPRESENTATIVES
Quick-Connective Couplings
Are Their Business
BUT SO ARE FLUID LINE PROBLEMS

To Avoid Air Line Troubles



...use the on-the-job know-how of the HANSEN Representative

By the very nature of his job, the Hansen representative is thoroughly familiar with practically every type of air line hook-up. He knows what works—and why it does. Frequently, the remedy for your difficulties, drawn from his experience in dozens of plants, is very simple.

When you need help over the rough spots—either when actual troubles arise, or when air line circuits are being planned or altered—give him a call. Believe us, you'll welcome the help that he can give you.

GEORGE W. WARDEN
Geo. W. Warden Co., Seattle
Maintains close contact with fluid line installations in plants throughout Pacific Northwest.

EDWARD BURKE
The Burke Co., San Francisco
Offers years of practical experience in handling of vacuums, compressed air, gasses and liquids. Author of engineering manual on aircraft hydraulics.

CHESTER CAUGHRON
Chester Paul Co., Glendale
Supplies pneumatic and hydraulic equipment to practically every type of industry in the thriving Southern California area.

REPRESENTATIVES

BALTIMORE	DETROIT	NEW ORLEANS
BIRMINGHAM	FT. WAYNE	PITTSBURGH
CHICAGO	HARTFORD	ROCHESTER
CLEVELAND	KANSAS CITY	SAN FRANCISCO
DALLAS	LOS ANGELES	SAVANNAH
DAYTON	LOUISVILLE	SEATTLE
DENVER	MILWAUKEE	ST. LOUIS
	MINNEAPOLIS	

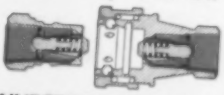
MONTREAL • TORONTO • VANCOUVER
Export Department: Cleveland

QUICK-CONNECTIVE FLUID LINE COUPLINGS

1. QUICK CONNECTION AND DISCONNECTION **2.** INSTANT AUTOMATIC FLOW OR SHUT-OFF

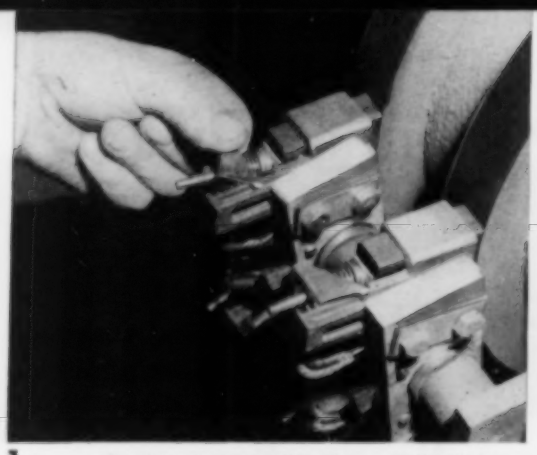
One-Way Shut-Off

Two-Way Shut-Off

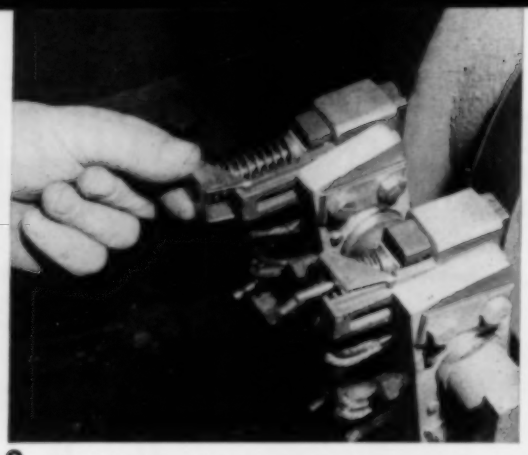


ALSO STRAIGHT-THROUGH QUICK-CONNECTIVE COUPLINGS
Send for Catalog!

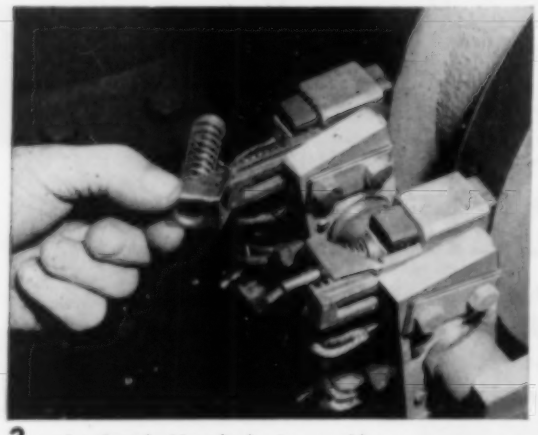
THE HANSEN MANUFACTURING COMPANY
4031 WEST 150th STREET • CLEVELAND 11, OHIO



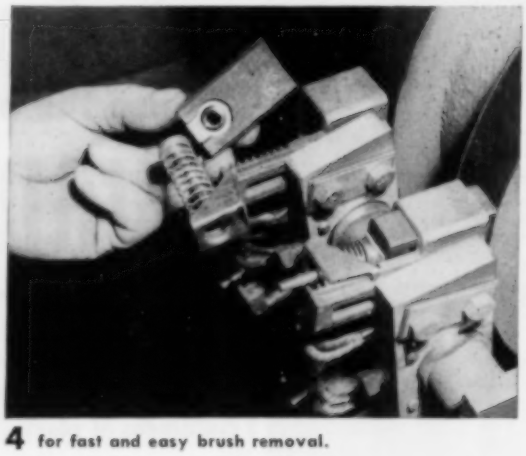
1 To reset brush tension, operator releases spring lock . . .



2 slides it back to relieve pressure . . .



3 and swings locking device to one side . . .

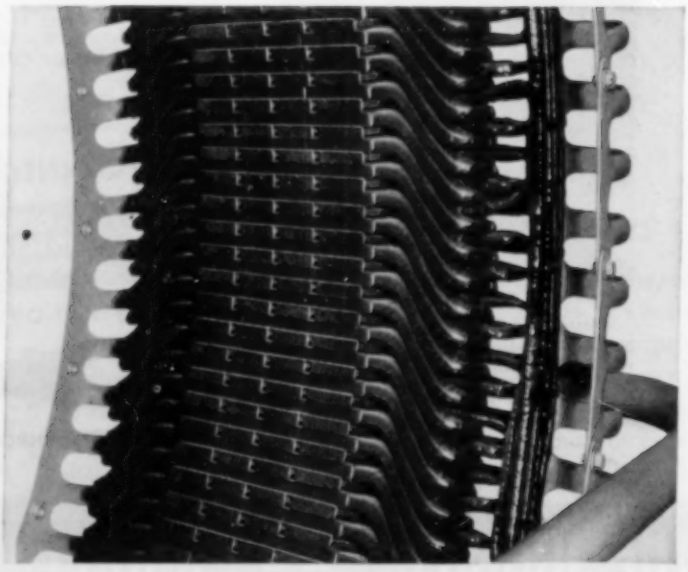


4 for fast and easy brush removal.

BRUSH-PRESSURE ADJUSTMENT, for maximum brush life, and replacement, to assure reliable motor service, are simple matters on G-E synchronous motors. A calibrated spring-loaded brush holder makes resetting brush tension or removal of brushes fast and easy. Brushes are staggered for even brush-ring wear.

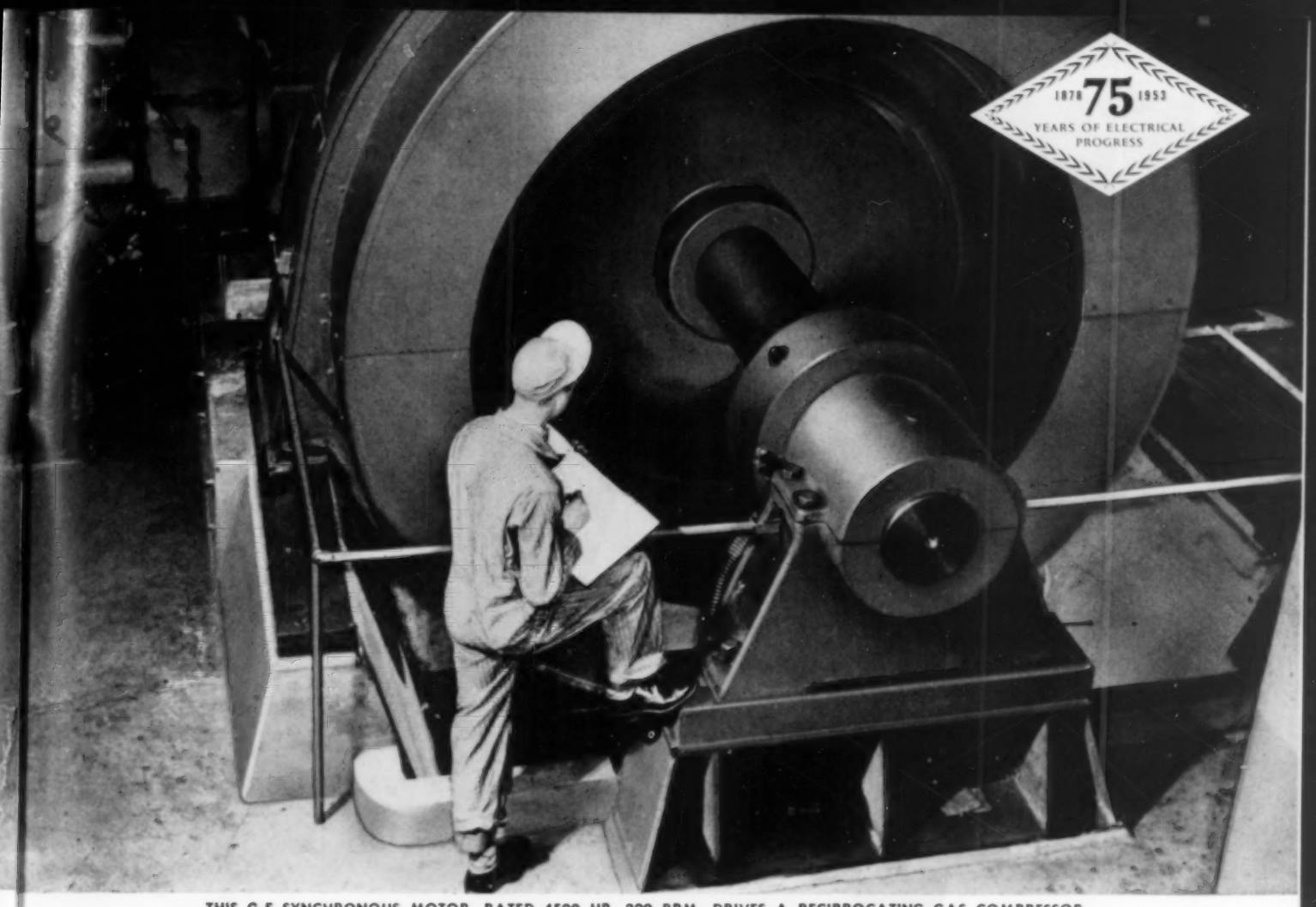
See How Routine Maintenance Is

BEARING LUBRICATION can be readily checked through a large sight-level gage on the bearing pedestal; and when oil is required, handy snap-top covers are provided for easy refilling, as well as oil-ring inspection. A drain plug is conveniently located for quick oil changes.



INSULATION CLEANING is fast on G-E synchronous motors. Windings are coated with a high-gloss Glyptal* varnish that resists the accumulation of dust and can be vacuum or air cleaned in most applications. In extremely dusty or oily atmospheres, deposits can be easily wiped from the windings. Clean windings mean longer insulation and machine life.

*Reg. trademark of General Electric Co.



THIS G-E SYNCHRONOUS MOTOR, RATED 4500 HP, 300 RPM, DRIVES A RECIPROCATING GAS COMPRESSOR.

Easier on G-E Synchronous Motors!

Routine maintenance involves three factors: brushes, lubrication, and insulation. To be sure that these areas are properly serviced, G-E synchronous motors have design features that make checking easy and maintenance fast. Close at hand and easy to adjust, the brush-rigging construction encourages your maintenance men to inspect regularly. Oil-level gage and inspection caps are arranged for quick checking and filling when necessary. The high-gloss insulation on G-E synchronous motor windings resists the adhesion of dust and minimizes the need for cleaning.

These features promote long, reliable motor service and save valuable time for your maintenance crews.

Before selecting your next heavy-duty motor, be sure to consider these important maintenance features. Call in your G-E representative. He will be glad to discuss the many money-saving applications for G-E synchronous motors. Meanwhile, you can obtain more information on G-E synchronous motors by requesting the following publications: GEA-5332, "Low-speed Synchronous Motors" or GEA-5426, "High-speed Synchronous Motors." Write to Section 770-28, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

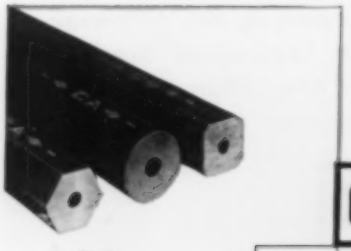
THE MINE FOREMAN

CRUCIBLE HOLLOW DRILL ROD

teamwork in specialties

In the mining industry the foreman is a mighty important guy. He is responsible for the successful performance of mining operations underground—for the supervision of mine workers and for keeping them properly equipped with the tools and supplies needed to get out their round. That's why in so many drilling operations you'll find that the mine foreman prefers Crucible Hollow Drill Rods.

He knows that with rising costs of labor and new equipment he must get the best service he can out of his rock drills . . . with minimum breakage and bit loss. And many a mine foreman has seen first hand that Crucible Hollow Drill Rods do just this . . . that they provide the lowest cost per foot per hole in hard rock drilling. For best drilling performance, use Crucible Hollow Drill Rods.



CRUCIBLE

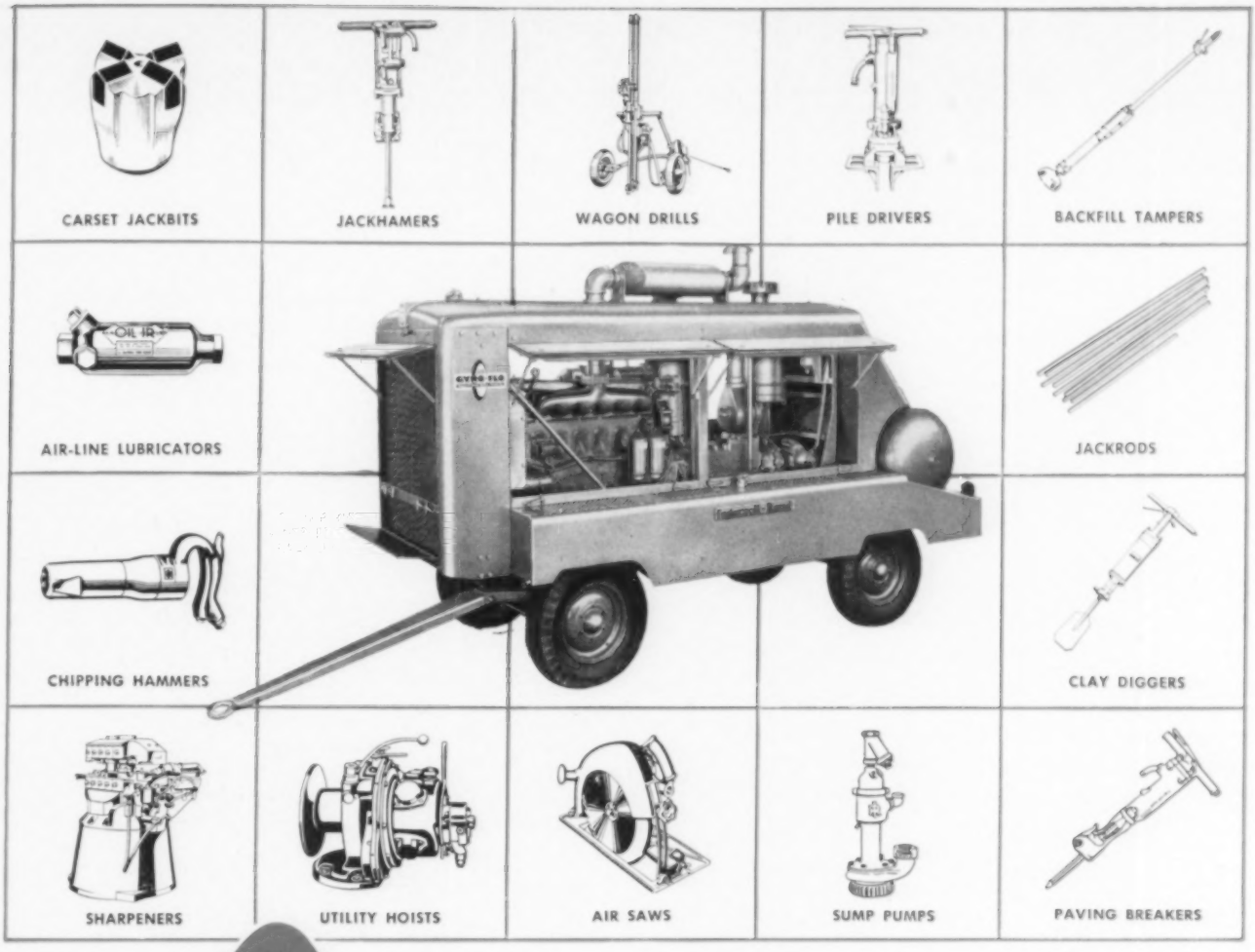
first name in special purpose steels

53 years of Fine steelmaking

HOLLOW DRILL RODS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



GYRO-FLO

Ingersoll-Rand *Rotary* Mobil-Air

The **Heart** *of the* **CONTRACTORS' COMBINATION**

887-14

The GYRO-FLO rotary compressor – most modern portable in the world–heads up Ingersoll-Rand's *complete* line of air power equipment for the contractor. The outstanding performance of units serving in every state in the U.S.A., and many countries abroad, has proven the dependability of the GYRO-FLO advanced design.

Here's what's different about GYRO-FLO compressors. They have no valves to leak–no pistons, rings, rods or clutch to wear out. Discharge pressures are held between 100 and 110 psi throughout the entire capacity range of the machine. This means maximum efficiency in the operation of rock drills and air tools. And discharge temperatures are at least 100° lower than with other compressors, assuring longer air-hose life.

Over 75 years of experience in building air power equipment goes into every Ingersoll-Rand machine. Put this experience to work for you. Contact your nearest I-R distributor or branch office for details on the application of the Contractors' Combination to your job.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

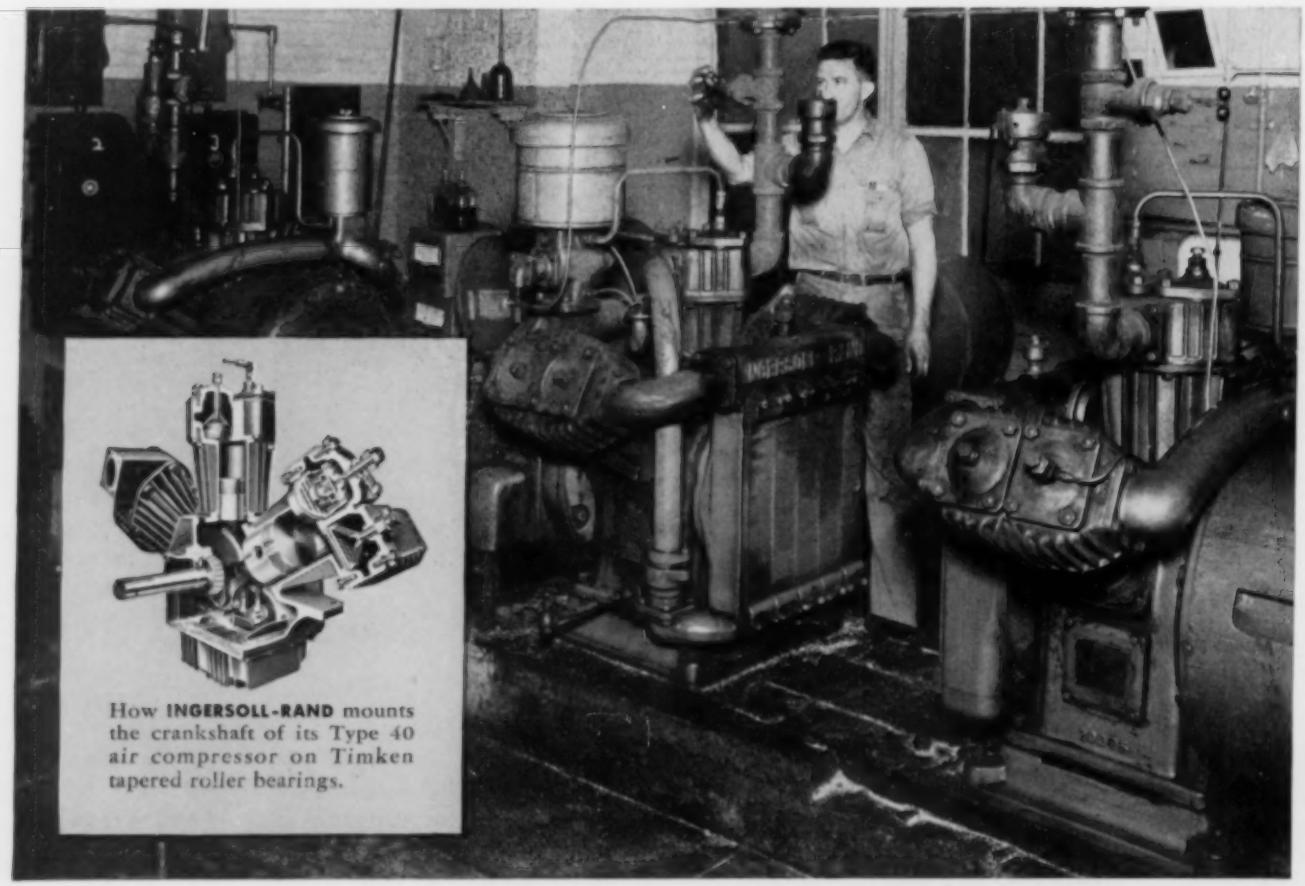
Keeps entire plant supplied with air, uses TIMKEN® bearings to cut down wear

THESE Ingersoll-Rand Type 40 air compressors supply all the air needed in an entire manufacturing plant. Crankshafts are mounted on Timken® tapered roller bearings to insure a steady supply of air and keep compressor wear down.

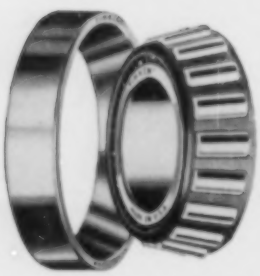
How? Eliminating friction between crankshaft and bearing eliminates crankshaft wear. Friction in the bearing is practically eliminated by the incredibly smooth surface finish and true rolling motion. With the crankshaft held in positive alignment, wear on adjacent parts is reduced. Closures are more effective because housings and shafts are held concentric. Dirt and moisture are kept out—lubricant kept in.

Line contact between the rollers and races of Timken bearings adds load-carrying capacity. Their tapered construction takes all radial and thrust loads. Specify Timken bearings in the machinery you build or buy. Look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



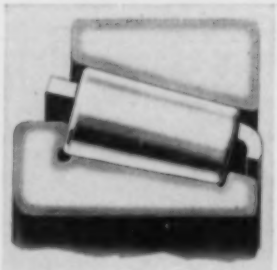
How **INGERSOLL-RAND** mounts the crankshaft of its Type 40 air compressor on Timken tapered roller bearings.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface and a tough, shock-resisting core. Result: longer bearing life.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ↓ AND THRUST → LOADS OR ANY COMBINATION ✳